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ANNUAL REPORT

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OF THE

BOARD OF REGENTS

OF THE

SMITHSONIAN INSTITUTION,

SHOWING

THE OPERATIONS, EXPENDITURES, AND CONDITION
OF THE INSTITUTION

FOR

THE YEAR 1884.

PART II.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1885.

The Annual Report of the Board of Regents of the Smithsonian Institution for the year 1884 consists of two parts, viz:

PART I.—Report of the Smithsonian Institution proper, showing its operations, expenditures, and condition.

PART II.—Report of the United States National Museum, showing its progress and condition.

REPORT

OF THE

UNITED STATES NATIONAL MUSEUM,

UNDER THE DIRECTION OF

THE SMITHSONIAN INSTITUTION,

FOR

THE YEAR 1884.

ANNUAL REPORT OF THE UNITED STATES NATIONAL MUSEUM FOR THE YEAR 1884.

SUBJECTS.

Part I.—Report of the Assistant Director, upon the condition and progress of the Museum in 1884.
II.—Reports of the Curators and Acting Curators of the several departments of the Museum.
III.—Papers based upon the collections in the National Museum.
IV.—Bibliography of the National Museum for 1884.
V.—List of accessions to the collections.

UNITED STATES NATIONAL MUSEUM,
Washington, January, 1885.

SIR: I have the honor to submit herewith a report upon the present condition of the U. S. National Museum and upon the work accomplished in its various departments during the year 1884.

Very respectfully,

G. BROWN GOODE,
Assistant Director.

Prof. SPENCER F. BAIRD,
Secretary of the Smithsonian Institution and
Director of the U. S. National Museum.

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PART I.

REPORT UPON THE CONDITION AND PROGRESS OF THE UNITED STATES NATIONAL MUSEUM IN 1884.

BY

G. BROWN GOODE, ASSISTANT DIRECTOR.

REPORT UPON THE CONDITION AND PROGRESS OF THE UNITED STATES NATIONAL MUSEUM IN 1884.

A.—GENERAL CONSIDERATIONS.

1. INTRODUCTORY REMARKS.

During the year the officers of the Museum have continued the work of arranging the material under their charge in the exhibition halls, laboratories, and store-rooms at their disposal.

It should be remembered that the reorganization of the Museum was begun late in 1881, at the time when the new Museum building was first made ready for occupation, and that 1884 is but the third year of systematic effort. Much progress has been made in removing from the exhibition halls the great mass of unclassified material which had been gathering for many years in the various store-rooms of the Smithsonian building and elsewhere, and which, on account of lack of space, had for the most part been allowed to remain in the original packing cases.

The floors of the Museum have at last been almost cleared, and at present only three of the seventeen exhibition rooms are occupied for storage purposes, viz: The southwest court, which is still full of specimens belonging to the departments of metallurgy, mineralogy, and lithology; and the southeast court, which is used as a general receptacle for empty cases and unmounted material belonging to the departments of zoology and anthropology. Before the end of February this work will be completed.

The additions to the Museum have been far more numerous and valuable than in any previous year. The activity of every department has been greater, both in respect to progress made in the administration of the collections and in respect to the number of scientific papers published by the officers in connection with their professional studies upon the specimens under their charge.

By direction of Congress the Smithsonian Institution, in connection with the Executive Departments of the Government and the Department of Agriculture, has participated during the year in the industrial expositions at Cincinnati, Louisville, and New Orleans.

Having been designated by yourself, and appointed by the President, representative of the Smithsonian Institution (including the National Museum and Fish Commission) on the Government Executive Board, charged with the representation of the interests of the General Government at these expositions, I have devoted the greater portion of my time during the latter half of the year to the work of preparation, an account of which will be given in fuller detail hereafter. Nearly every department of the Museum has necessarily been called upon to assist in this work, and a large proportion of the activity of the force has consequently been diverted to this channel. Although the progress of regular work has thereby suffered much interruption and delay, it is hoped that the service will eventually be benefited and final organization accelerated rather than impeded. At the present time the exposition at New Orleans is in progress, and the collections sent thither by the Museum cover a space fully equal to one-third of the entire exhibition space in the Museum building in Washington.

In accordance with established custom, the exhibition work has been carried on entirely under the direction of the regular Museum officers, assisted by such additional workers as it was found practicable to engage temporarily. Many of our officers accompanied the collections to superintend their installation in the exposition building. Several of the curators are at present absent in New Orleans and will be obliged to return to that city at the close of the exhibition, in May, to attend to the packing and return of the collections.

Following established usage, I have reviewed the work of the several scientific departments of the Museum, as well as that of the division of administration. The reports of the curators of the several departments are presented in full, their extent and importance being so great as to render this necessary. In my own report I have included an account of the operations of the department of arts and industry, for the present assigned to my care, in preference to preparing a special curator's report upon this department: the reports of certain of the curators of "sections" of this department are, however, furnished with the others.

In the present report, as in those which have preceded it, certain suggestions relating to the administration of the Museum are made for which I desire to be held individually responsible, and which the reader should not assume to be definitely determined elements of the policy of the Museum, since they may, any or all of them, at some future time, either in their present forms or with modifications, be recommended for adoption, or pronounced undesirable.

This being the first of the separately printed series of Museum reports, some statements which have already been printed in previous reports are repeated, in an abridged form, for the purpose of presenting a general exhibit of the policy of the Museum.

It had been the desire of myself and my associates to present in this the first report of the new series a somewhat exhaustive statement of the present condition of the Museum, together with a review of its past history as a whole and of its several departments: the exigencies of Exposition work having made this impossible, we hope to prepare such a report for the coming year.

2. THE FOUNDATION AND SCOPE OF THE NATIONAL MUSEUM.

Foundation and legal status.—The National Museum was organized in 1846 by the act of Congress transferring to the Smithsonian Institution the custody of the "National Cabinet of Curiosities," at that time deposited in the Patent Office building.* These collections were, in 1857, placed in the Smithsonian building, the Regents of the Institution having accepted the trust on condition that the necessary appropriations for their maintenance should be continued by Congress.

The act above referred to provides that "all objects of art and of foreign and curious research, and all objects of natural history, plants, and geological and mineralogical specimens belonging or hereafter to belong to the United States, which may be in the city of Washington," shall be delivered to the Regents of the Smithsonian Institution, and together with new specimens obtained by exchange, donation, or otherwise, shall be so arranged and classified as best to facilitate their examination and study.†

The National Museum is the authorized place of deposit for all objects of natural history, mineralogy, geology, archæology, ethnology, &c., belonging to the United States or collected by the Coast and Interior Survey, the Geological Survey, or by any other parties for the Government of the United States, when no longer needed for investigations in progress.‡

Organization and government.—The establishment of the Smithsonian Institution, to which, in addition to the carrying out of the other requirements of the bequest of Smithson, is intrusted the control of the National Museum, is composed of the President of the United States and his Cabinet, the Commissioner of Patents, and a Board of Regents, which has for its members the Vice-President and Chief Justice of the United States, three members of the Senate, three members of the House of Representatives, and six other persons, not members of Congress, two of whom are residents of the city of Washington.§

The management of the National Museum is intrusted to the Secretary of the Smithsonian Institution, who is, *ex-officio*, its director. He is aided by a staff of assistants, who are chosen by him, and for whose action he is responsible to the Regents. The constitution of the staff is constantly changing with the varying needs of the Museum.

This staff is at the present time composed of an assistant director, six curators and five assistant curators, twelve honorary curators, serving without pay, a number of aids, acting in various capacities, a registrar, chief taxidermist and chief modeler, besides a considerable force of preparators, mechanics, watchman, clerks, laborers, &c.

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* AN ACT to establish the "Smithsonian Institution" for the increase and diffusion of useful knowledge among men. (Approved August 10, 1846; Revised Statutes, title lxxiii, sections 5579–5594.)

† Revised Statutes, section 5586.

‡ Statutes Forty-fifth Congress, third session, chap. 182, p. 394.

§ Revised Statutes, 5580.

The collections are stored and exhibited in the building erected for the use of the Smithsonian Institution between 1847 and 1857, and in the new building, just finished, known as the "National Museum."

Composition of the collections.—The Museum is made up, in large part, of the following materials:

1. The natural-history and anthropological collections accumulated since 1850 by the efforts of the officers and correspondents of the Smithsonian Institution.

2. The collections of the Wilkes Exploring Expedition, the Perry Expedition to Japan, and other naval expeditions.

3. The collections of the scientific officers of the Pacific Railroad Survey, the Mexican Boundary Survey, and of the surveys carried on by the Engineer Corps of the Army.

4. The collections of the United States Geological Surveys under the direction of the United States Geologists Hayden, King, and Powell.

5. The collections of the United States Fish Commission.

6. The gifts by foreign Governments to the Museum or to the President and other public officers of the United States, who are forbidden by law to receive them personally.

7. The collections made by the United States to illustrate the animal and mineral resources, the fisheries, and the ethnology of the native races of the country, on the occasion of the International Exhibition at Philadelphia in 1876, and the fishery collections displayed by the United States in the International Fisheries Exhibition at Berlin in 1880 and at London in 1883.

8. The collections given by the Governments of the several foreign nations, thirty in number, which participated in the exhibition at Philadelphia.

9. The industrial collections given by numerous manufacturing and commercial houses of Europe and America, at the time of the Philadelphia Exhibition and subsequently.

10. The material received, in exchange for duplicate specimens, from the museums of Europe, Asia, and Australasia, and from numerous institutions and collectors in North and South America.

Adjuncts to administration.—All necessary adjuncts to the work of the Museum, a working library, a chemical laboratory, a photographic establishment, a workshop for taxidermy, modeling, and the preparation of skeletons, and several smaller workshops are carried on as a part of the general work of administration.

Publications of the Museum.—The scientific results of the labors of the officers of the Museum, and of investigations upon the collections belonging to it, are to be found for the most part in the following works:

Bulletin of the United States National Museum;

Proceedings of the United States National Museum;

Reports of the Smithsonian Institution;
Smithsonian Miscellaneous Collections;
Smithsonian Contributions to Knowledge;
Reports of the Bureau of Ethnology of the Smithsonian Institution;
Reports of the United States Commissioner of Fisheries;
Bulletin of the United States Fish Commission;

also occasionally in other scientific reports of other scientific departments of the Government, especially those of the United States Geological Survey, many of whose officers are also honorary officials of the Museum.

A catalogue of the scientific papers emanating each year from the Museum or based upon Museum interests has been published each year since 1881 in the Smithsonian Report.

3. THE FUNCTION AND AIMS OF THE MUSEUM.

Objects and methods of work.—The collections in the National Museum are intended to exhibit the natural and industrial resources, primarily of the United States, and secondarily of those of the remainder of the world, for purposes of comparison.

The activity of the Museum is exerted in three directions:

(*a*) The permanent preservation of objects already in its possession.

(*b*) The acquisition of new material.

(*c*) The utilization of material already in its possession, by its exhibition in the most instructive manner, and by the prosecution of and publication of scientific researches for which it forms the basis; by the distribution of properly-labeled duplicates of materials to colleges and other educational institutions.

The preservation of material is accomplished by means of the vigilance of the curators and the skill of the preparators.

New material is acquired (*a*), from the various Government surveys and expeditions, in accordance with law; (*b*) by gift from individuals, from other institutions, and from foreign governments; (*c*) by exchange for its duplicate specimens or publications; (*d*) by the efforts of officers of the Museum, who make collections in connection with their regular duties, or are detailed for special service of this nature; (*e*) by purchase when appropriations are made by Congress for that purpose.

The treasures in the custody of the Museum are utilized to the world by exhibiting them to the public, and by encouraging investigations on the part of the officers of the Museum and other suitable persons, and facilitating the publication of the results; also by the distribution to other museums and educational institutions of duplicate specimens, which have formed the basis of scientific investigation, these being identified and labeled by the best authorities.

The Museum by these means fulfills a threefold function:

1. It is a museum of record, in which are preserved the material foundations of a very great number of scientific memoirs—the types of

numerous past investigations. This is especially the case with those materials which have served as a foundation for the numerous governmental reports upon the resources of the United States. Types of investigations made outside of the Museum are also incorporated.

2. It is a museum of research, by reason of the policy which aims to make its contents serve as fully as possible as a stimulus to and a foundation for the studies of scientific investigators. Research is a necessary part of the work, in order that the collections may be properly identified and arranged. Its officers are selected for their capacity as investigators, as well as for their ability as custodians, and its treasures are open to the use of any trustworthy student.

3. It is an educational museum of the broadest type, by reason of its policy of illustrating by specimens every group of natural objects and, so far as it may prove practicable, such other collections as may be found useful for the instruction of the public which are explained by displaying descriptive labels adapted to the popular mind, and by its policy of distributing its publications and its named series of duplicates.

4. THE DEVELOPMENT OF THE MUSEUM IDEA.

Periods in the history of the Museum.—The history of the National Museum may be divided into three periods: First, that from the foundation of the Smithsonian Institution to 1857, during which time specimens were collected purely and solely to serve as materials for research, no special efforts being made to exhibit them to the public or to utilize them except as a foundation for scientific description and theory. Second, the period from 1857, when the Institution assumed the custody of the "National Cabinet of Curiosities," to 1876. During this period the Museum became a place of deposit for scientific material which had already been studied, this material, so far as convenient, being exhibited to the public, and, so far as practicable, made to serve an educational purpose. Third, the present period, beginning in the year 1876, in which interval the Museum has entered more fully into the additional task of gathering collections and exhibiting them on account of their value from an educational standpoint.

In the first period, the main object of the Museum was scientific research; in the second, the establishment became a museum of record as well as of research; while in the third period is growing up the idea of public education. As soon as a judiciously selected series of objects from the material already within the walls of the Museum can be displayed properly to the Museum visitors, the National Museum of the United States will have commenced to fulfill all the demands which are likely ever to be made upon it.

The three ideas of scientific research, record, and education, co-operative and mutually helpful as they are, are essential to the development of any comprehensive and philosophically organized museum. Materials are gathered together that they may serve as a basis for scientific thought. Objects which have served as a foundation for scientific study, or which, from their historical significance, are treasured up and preserved from destruction that they may serve purposes of record—permanent land-marks of the progress of the world in thought, in culture, or in industrial achievement—they are not only records of what has been done in the past, but they constitute the most valuable of all materials for future study. The museum of record, then, is not only an accessory to the museum of research, but an adjunct which accomplishes similar and fully equal results in the same direction.

The contents of the museum of research and the museum of record, if no other objects be sought save those already mentioned, might without impropriety be stored away in vaults and cabinets, inaccessible to any except the specialist. To give them their highest value, however, they should be arranged in such a manner that hundreds of thousands of people should profit by their examination instead of a very limited number, and that they should afford a means of culture and instruction to every person, young or old, who may have opportunity to visit the place in which they are preserved.

It is much to be regretted that many specialists, intent chiefly upon the study of certain scientific problems in which they individually are absorbed, are disposed to neglect the claims of the educated public to the enjoyment and instruction which museums afford. They do not hesitate to say that scientific museums should be administered for the benefit solely of persons engaged in research. At a recent meeting of professional naturalists, an eminent investigator in natural science publicly expressed his opposition to exhibiting certain scientific collections to "the gaping clowns who form the majority of the visitors to our museums." Such a spirit defeats its own purposes, and such a remark deserves no answer. The experience of Europe with its magnificent educational museums and the history of the several expositions in the United States should be quite sufficient to satisfy any one who has studied the matter that the museum is an educational power even more influential than the public library.

The venerable director of the South Kensington Museum, speaking from an experience of thirty-five years, not only in his own establishment, but in the work of building up the score of sister museums, now under its wing, located in the various provincial towns of Great Britain, remarked to the writer: "We educate our working people in the public schools, give them a love for refined and beautiful objects, and stimulate in them a desire for information. They leave school, go into the pursuits of town life, and have no means provided for the gratification of the tastes which they have been forced to acquire. It is as much the duty of the government to provide them with museums and libraries for their higher education as it is to establish schools for their primary instruction."

The educational museum is of comparatively recent origin, and may be said to be one of the outgrowths of the modern industrial exposition. The World's Fair of London in 1851, the first of a long series of international exhibitions, was utilized by the Government of Great Britain as a starting-point for a number of national educational museums, the most perfect which have as yet been organized, and many subsequent World's Fairs have been taken advantage of in a similar manner, so that nearly every civilized country now has a system of public museums.

One of the results of the Philadelphia Exhibition of 1876 was that it made plain to the people of the United States the educational importance of great museums. It suggested the thought that if so much that is inspiring and instructive can be imparted by the exhibition of natural and manufactured objects gathered together, chiefly with commercial ends in view on the part of the exhibitors, necessarily somewhat unsystematically arranged and with little effort toward labeling in an instructive manner, an immense field is open for educating the public by gathering together a selected series of similar objects, which may be so classified and explained by means of labels and guide-books that they shall impart a consistent and systematic idea of the resources of the world and of human achievement.

The United States has as yet no system of educational museums, although there are several museums of limited scope, which have successfully carried out the educational idea in the arrangement of their materials; for instance, the American Museum of Natural History in New York, the Museum of Comparative Zoology in Cambridge, the Museum of the Peabody Academy of Sciences in Salem, the Philadelphia Academy of Natural Sciences, the Boston Museum of Art, the Metropolitan Museum of Art in New York, the Pennsylvania Museum of Industrial Art, the Peabody Museum of Archæology in Cambridge, the Peabody Museum of Yale College, and the Boston Society of Natural History.

The same remark applies with equal force to the museums of Europe. There are, however, institutions, like the Museum of Practical Geology, the museum of the Royal College of Surgeons, the museums at Bethnal Green and South Kensington, in London, the Museum of Industrial Art at Berlin, the Ethnological Museum at Leipsic, the National Museum of Germany at Nuremburg, the Bavarian National Museum at Munich, and others, which have admirably carried out a single idea, or a limited number of ideas, and which are marvelously rich in material and arranged in a manner full of suggestiveness.

The museum now under the charge of the Smithsonian Institution has, through the action of influences beyond the control of its management, in fact by the terms of the act of Congress which authorizes its existence, been made the depository of collections in every department—geological, botanical, zoological, and anthropological—and its work has of necessity been organized upon a very comprehensive plan.

5. PRINCIPLES OF ARRANGEMENT OF COLLECTIONS DESIGNED FOR PUBLIC EXHIBITION.

The majority of visitors to any museum go thither for amusement, or actuated by praiseworthy curiosity. Many have no desire to gain instruction, and even if actuated by such a purpose, would fail to accomplish their object by a visit to an ordinary museum. This is due in part to the fact that where so much duplicate material is exhibited the really instructive objects are lost to view; that the objects in but few museums are labeled in a really instructive manner; but is principally because the objects exhibited are not of the kind best adapted to the needs of the museum-visiting public. The visitors carry away only general impressions of rooms full of glass cases containing animals, minerals, and "curiosities," gathered by travelers among uncivilized races. Professor Huxley has defined a museum as "a consultative library of objects," and this definition, true enough in itself as a description of the best ideal museums, is unfortunately too true a description of all. Most collections are as useless and little instructive to great masses of our people, who know not how to use them, as are our libraries of consultation. The museum of research, since it is intended chiefly for investigators, should be the consultative library. The educational museum should resemble a great encyclopedia rather than a library full of learned volumes. Every library of importance, however, contains the cyclopedias for the general reader and the monographs for the scholar. The larger public museums may in like manner be adapted to the needs of both student and general visitor.

To overcome the difficulties in the way of this adaptation many steps must be taken which are not usual in museums. By far the most important of these is in the direction of thorough labeling.

An efficient educational museum, from one point of view, may be described as a collection of instructive labels, each illustrated by a well-selected specimen.

There are many obstacles to the effort to build up a museum upon this basis. Museums which exhibit only such objects as are in themselves beautiful or marvelous cannot fail to be attractive, no matter how poorly the objects are arranged and labeled.

When, however, the objects depend for their interest upon the explanations on the labels, and upon the manner in which they are placed, relatively to each other, a responsibility a hundred-fold greater is entailed upon the curators. The materials of such a museum may be compared to piles of brick, stone, lumber, and architectural ornaments, which by themselves possess little apparent interest, but which may by thought and labor be combined into an imposing and useful edifice.

Principles of administration.—Certain cardinal principles may be announced which should be considered in the arrangement of every public museum: (I) every article exhibited should illustrate an idea, and no two objects should be shown which illustrate the same idea in a similar manner; (II) the idea which any object is intended to illustrate should be explained upon its label in such a manner that any intelligent visitor, without previous special knowledge of the subject, may be able to learn (*a*) why the object is shown, and (*b*) what lesson it is intended to teach; (III) the objects should be so carefully classified that their relations to each other may be recognized by the visitor, so that taken together, they shall suggest general conclusions; in the formation of these conclusions he should be aided by certain general or collective labels which relate to and describe groups of objects in a manner similar to that in which the individual labels describe separate articles; (IV) the labels, individual and collective, should be supplemented by guide-books and manuals for special departments, which shall contain, arranged systematically, all the information given upon the labels, and which shall be illustrated by engravings of the more important objects.*

Industrial museums, as a rule, exhibit only those articles which are designed and constructed in the most sumptuous manner—the armor of kings and knights, the furniture of palaces, the most artistic of metal work, stone work, and wood work. The ethnological museums, on the other hand, admit only the implements and costumes of savage and partially civilized races. Between the two there is a great chasm to be filled. It is as important to preserve in museums the more humble and simple objects which illustrate the domestic economy and customs of the masses of the people of civilized nations, as to search for similar objects in distant lands, or to treasure up only the objects which, on account of their cost, are seen and used only by the most wealthy and luxurious classes in the civilized community.

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* The following general rules have been formulated:

1. No object will be placed on exhibition which is not of evident educational value, and likely to interest and instruct a considerable percentage of the persons visiting the Museum.

2. The exhibition of duplicate material is to be avoided, except in instances where similar objects can be shown to advantage in different divisions of the Museum.

3. Each object will be placed in a case of the form best suited for its effective display, and the light, color of the background, &c., will be so adjusted as to show it to best possible advantage, and with the least possible fatigue to the eyes of the visitor.

4. Each object, or group of objects, will be accompanied by a large plainly printed label, which will give a concise description of what is shown, an account of its origin and uses, a synopsis of its history, and the name of the person or organization contributing it to the Museum. The character of the Museum is such that any labels which might suggest advertising for business purposes must be excluded. It will be the policy of the Museum, however, to give prominence on each label to the name of the person or business house from whom it has been received, provided that the object is a gift to the Museum.

5. The objects will be grouped together in systematic order, and each case will be provided with a general descriptive label. In the case of collective exhibits, the general label may also give the name of the contributor.

6. The specimens will be illustrated and supplemented by pictures, diagrams, books, and maps, in such manner that the Museum may form an encyclopedia, the illustrations for which are in the exhibition cases, the text in the labels.

7. Guide-book manuals of the different departments will be published, which will embody in concise and systematic form the information given by the specimen labels, together with such illustrative material as may seem necessary to present in addition.

Collections of this character are, perhaps, as well entitled to be called "anthropological collections" as those usually included under this name, which are intentionally more limited in their scope.

To supply the place of objects too large to be placed in a museum, too evanescent to have been preserved, or which, on account of their rarity or neglect in preserving them at the time when they could have been obtained, are necessarily lacking in the collections, it is essential that museums should assume the administration of great quantities of material such as is usually consigned to the library or to the picture-gallery. Otherwise, deficiencies in groups of objects, which should illustrate by their collective meaning a general idea, will much impair their value. Pictures and diagrams should be freely used as temporary or permanent substitutes for specimens which may be lacking, and also to supplement and explain the descriptive labels. In many sections it may be impossible to exhibit anything but pictures. It is needless to point out the difference in the influence of a series of plates, like those, for instance, in Audsley and Bowes "Keramic Art in Japan," the publications of the Arundel Society, the autotypes of Braun, or the illustrations of many ethnographic works, if displayed in a public museum, where they are seen daily by thousands of visitors, or hidden except from the initiated few in a library, where they are only practically accessible to students with abundance of time and training in the use of books.

Much of the material usually shown in art galleries and art museums, such as is ordinarily used to illustrate the history of art, or is preserved on account of its artistic suggestions, may be displayed in a much more instructive manner in a museum without in the least lessening its value to the artist or designer. Portraits, pictures of buildings, of costumes, of geological features in scenery, of ceremonies, and of social customs may be arranged and administered as anthropological specimens. In addition, much may be accomplished by having standard works, relating to the special departments of the museum, placed in convenient places in the exhibition halls, and, if necessary, fastened to desks in such a manner that they could not be removed, while easily accessible to any person who might wish to become informed upon special topics relating to objects being examined.

6. SYSTEMS OF CLASSIFICATION.

The chief requisite to success in the development of any museum is a thoroughly available plan of organization and a philosophical system of classification.

The arrangement of the natural-history collections—zoological, botanical, and geological—which will doubtless always constitute a very large proportion of the treasures of the National Museum, and which will undoubtedly in the future, as at the present, occupy the attention of at least three-fourths, if not more, of the Museum staff, is a simple matter, since naturalists are pretty generally in accord as to the affinities of different groups to one another, and since the grouping of the objects in the Museum cases may be made to accord very closely with the schemes laid down by systematists. When, however, it is necessary to take up the arrangement of collections which illustrate the history of human culture, the lack of a convenient and instructive system becomes very apparent.

Much thought has been devoted to these subjects by the officers of the Museum, especially during the past four years. Many of the principal museums of Europe have been studied, their catalogues and publications minutely compared, and correspondence carried on with their officers. It is hoped that the plans which have been developed as the result of these labors may include the best features of similar plans hitherto proposed, but it is undoubtedly true that no plans can be laid down, except in a tentative way, since the experience of each year reveals possibilities and impossibilities not previously thought of by the student of museum methods.

In my first report, published in 1881, I printed a scheme of classification for the anthropological collections which, in certain quarters, did not meet with favor. It was a purely tentative effort, published for the purpose of inviting criticism, and not in any way supported by official sanction. Some of the criticisms which it called forth were evidently just and will have due weight in planning for future work. The scheme referred to has been objected to by museum administrators because it breaks up their favorite and time-honored method of geographical arrangement. It is the result of the experience of the officers of this Museum that it is absolutely impossible to handle our immense collections if we adhere to the methods of older and smaller establishments. It is well known that some ethnological collections should be arranged geographically, some teleologically, some with reference to materials of which the objects are made.

In this Museum in different departments of the work we shall doubtless find it convenient to employ all these systems.

Our collections are at present being arranged in accordance with a teleological rather than geographical plan of classification, objects of a similar nature being placed side by side, musical instruments together, weapons together, &c., and arranged in such a manner as to show the progress of each idea from the most primitive type. In discarding the ethnographic method of arrangement, however, special care has been taken not to sacrifice the possibility of bringing together the objects belonging to any particular locality or race, if this shall at any time be required for purposes of study.

In our method of installation, objects are mounted in glass-covered trays or deep frames, 24 by 30 inches in dimension, which are arranged for study or exhibition in cases of various forms. The articles belonging to two different tribes are never mounted together in the same tray; and if at any time it should be found desirable to bring together the collections from any given race, for instance, from the Eskimos, the Siamese, or the Japanese, this might be accomplished in a few hours; in fact, when once the present system of mounting has been completed, the rearrangement of the Museum upon the ordinary ethnographic plan would be the work of only a few hours, and may be effected by a small force of mechanics and laborers under the direction of a single curator.

It is no part of the plan, nor has it ever been, to separate articles which belong together. The parts of any collection or group of objects which may justly be considered a unit of administration are always kept together; for instance, if a costume is complete it is not intended to dissect it and distribute its parts. The separate elements of a costume are only placed by themselves when they have no related objects associated with them. In the same way a costume of a family, whether composed of two or ten individual suits, might with propriety be regarded as a unit. Collections illustrating the history of a special tribe in a monographic way may also with propriety be kept together. Such a collection would, however, not be assigned to the department of art and industry, where the preferred method of arrangement is evolutionary or progressive, but would rather be made over to the department of ethnology.

The studies of the collections already made by Professor Mason, the new curator of Ethnology, reveal the fact that there is really no conflict between a systematic scheme classification and a geographical one, because, in those series of objects which have already been arranged, the one scheme has always proved to be explanatory of the other. They are mutually beneficial; indeed, it is impossible to understand the one without studying the other.

B.—THE MUSEUM STAFF.

The staff of the Museum as now organized consists of two classes of workers—the scientific officers, and the administrative officers; the former reporting to the Director of the Museum, the latter to the Assistant Director, who also has general supervision of the administrative work of the curators.

7. THE SCIENTIFIC STAFF.

In the scientific staff of the Museum there are at present nineteen curatorships, some of which are subdivided below, so that the number of heads of departments and sub-departments is twenty-five, and the total number of men in the scientific staff thirty-six, of whom twenty-four are in the pay of the Museum, and the others honorary, five being detailed for this duty by the Director of the United States Geological Survey, one by the Director of the Bureau of Ethnology, others by the United States Commissioner of Fisheries, and by the Secretary of the Navy, while two are volunteers. It may be stated here that the details just referred to are in every instance made in the interests of co-operation with those Government bureaus engaged in work closely connected with that of the Museum. The paleontologists of the Geological Survey find it so much to their advantage to have access to the paleontological collections of the Museum and the use of the laboratories, storage cases, and general administrative machinery, that they are permitted by their chief to assume the responsibilities of curatorships and perform a general work of supervision; and the mineralogists and the curator of aboriginal pottery are similarly situated. In nearly every instance, however, the Museum supplies the honorary curators with assistants, who relieve them of much of the routine work.

The curatorships are now organized as follows:

DIVISION OF ANTHROPOLOGY.

Department I.—Arts and industries, the Assistant Director acting as curator (A. Howard Clark, assistant, two preparators), with subcuratorships as follows:

(*a*) Materia Medica. Dr. H. G. Beyer, U. S. N., honorary curator, with one clerk.

(*b*) Textile Industries. Romyn Hitchcock, acting curator.

(*c*) Fisheries. R. Edward Earll, curator.

(*d*) Animal Products. R. Edward Earll, acting curator.

(*e*) Naval Architecture. Capt. J. W. Collins, United States Fish Commission, honorary curator.

(*f*) Foods. W. O. Atwater, acting curator.

(*g*) Historical Relics.

In this department, it may be stated, is administered very much of the material, such as is usually arranged by museums in their ethnological series, and the Curator of Ethnology is consequently acting as adjunct curator in the Department of Arts and Industries.

Department II.—Ethnology. Dr. Otis T. Mason, curator, with one preparator and two clerks.

Department III (*A*).—Antiquities. Dr. Charles Rau, curator, E. P. Upham, assistant.

Department III (*B*).—American Prehistoric Pottery. W. H. Holmes, Bureau of Ethnology, honorary curator, Dr. Edward Foreman, assistant, one preparator.

DIVISION OF ZOOLOGY.

Department IV.—Mammals. Frederick W. True, curator, one clerk, two preparators.

Department V (*A*).—Birds. Robert Ridgway, curator, Leonhard Stejneger, assistant, one clerk and one preparator.

Department V (*B*).—Birds' Eggs. Capt. Charles Bendire, U. S. A., honorary curator (volunteer), and one clerk.

Department VI.—Reptiles and Batrachians. Dr. H. C. Yarrow, honorary curator (volunteer).

Department VII. Fishes. Dr. T. H. Bean, curator, two assistants detailed from the United States Fish Commission.

Department VIII.—Comparative Anatomy. Frederick W. True, curator, F. A. Lucas, assistant, and one preparator.

Department IX.—Mollusks. W. H. Dall, curator, R. E. C. Stearns, adjunct curator, both of U. S. Geological Survey, one clerk.

Department X.—Insects. Prof. C. V. Riley, honorary curator (volunteer).

Department XI.—Marine Invertebrates. Richard Rathbun, U. S. Fish Commission, curator, one assistant, and one clerk detailed from the United States Fish Commission.

Department XII (*A*).—Invertebrate Fossils, Paleozoic. C. D. Walcott, United States Geological Survey, honorary curator.

Department XII (*B*).—Invertebrate Fossils, Mesozoic and Cenozoic. Dr. C. A. White, United States Geological Survey, honorary curator, J. B. Marcou, United States Geological Survey, honorary assistant, one clerk.

DIVISION OF BOTANY.

Department XIII.—Fossil and Recent Plants.—Lester F. Ward, United States Geological Survey, honorary curator, one clerk, one preparator.

DIVISION OF GEOLOGY.

Department XIV.—Mineralogy. Dr. F. W. Clarke, United States Geological Survey, honorary curator, W. S. Yeates, assistant.

Department XV.—Lithology and Physical Geology. George P. Merrill, acting curator, one preparator.

Department XVI.—Metallurgy and Economic Geology. Fred. P. Dewey, curator.

A comparison of the above classification with that presented in the reports for 1883 will show changes in the following particulars, namely, that the scope of the Department of Arts and Industries has been augmented during the year by the addition of two sections: (1) Naval Architecture, of which Capt. J. W. Collins is the honorary curator, and (2) Animal

Products, in charge of R. Edward Earll, as acting curator. Mr. Earll has also been acting as curator of the section of Fisheries. For greater convenience the section of Foods and Textiles has been reorganized in two divisions: (1) Textile Industries, Mr. Romyn Hitchcock as acting curator, and (2) Foods, under the direction of Prof. W. O. Atwater.

To the Division of Anthropology has been added the Department of American Aboriginal Pottery, under the honorary supervision of Mr. W. H. Holmes, of the Bureau of Ethnology. The Department of Ethnology has been organized under the curatorship of Prof. Otis T. Mason, taking the place of the Department of Races of Men in the classification as given in the report for last year.

The Division of Zoology has been increased by the addition of (1) the Department of Birds' Eggs, Capt. Charles Bendire, U. S. A., serving, as honorary curator; and (2) the Department of Comparative Anatomy under Mr. F. W. True, assisted by Mr. F. A. Lucas. The three Departments of Crustaceans, Worms, and Radiates and Pro tozoans, as classified in 1883, have been merged in one, the Department of Marine Invertebrates, under Mr. Richard Rathbun. Department XVI, Physical Geology, under the old classification, is now an adjunct of the Department (XV) of Lithology under the direction of Mr. George P. Merrill; and the Department of Mineralogy, which was in 1883 connected with that of Lithology, is now classified separately.

8. THE ADMINISTRATIVE STAFF.

The classification of the departments in the Division of Administration remains essentially the same as detailed in the report for last year, and is as follows:

Department A.—Direction. This department is under the immediate charge of the Assistant Director, who, as executive officer to the Director, has general supervision of the routine work in all the departments, the care of the installation of specimens, the construction of cases, &c., the purchase of supplies, &c., the assignment of work and of apartments, leaves of absence, curators' reports, and routine correspondence. The organization of the offices of the Director and Assistant Director has not been materially changed during the year, except that, on account of the increase in efficiency of the other departments of the Division of Administration, a considerable amount of routine work, with its accompanying responsibilities, has been transferred from the Assistant Director to the heads of these departments. During the absence of the Assistant Director for five weeks during the summer, on business connected with the preparation of the Smithsonian exhibit at the World's Exposition in New Orleans, Mr. F. W. True was designated to act in his place. Mr. R. I. Geare, executive clerk, has rendered most efficient service in the Assistant Director's office.

Department B.—Registry and storage. This department is in charge of Mr. S. C. Brown, whose duties pertain to the reception, unpacking, and assignment of accessions and other packages, the packing and shipment of boxes, &c., the storage of accessions subject to the call of curators, and the custody of department catalogue books.

Department C.—Archives. Mr. S. C. Brown also has charge of all papers relating to accessions and the distribution of Museum material.

Department D.—Library. Mr. F. W. True, librarian.

Department E.—Publication. Dr. Tarleton H. Bean performs the duties of editor of "Proceedings" and "Bulletins."

Department F.—Labels. Mr. A. Howard Clark in charge. His duties consist in the arrangement of material for labels, in receiving the printed labels from the printer, and in arranging a duplicate set of labels for reference.

Department G.—Duplicates and exchanges. Mr. S. C. Brown in charge. The work of this department includes the distribution of duplicate collections for exchange and the custody of the files relating to applications and proposals for exchange.

Department H.—Property and supplies. Mr. C. W. Schuermann in charge. All cases, furniture, and supplies of all kinds are under his care, and are distributed by order of the Assistant Director.

Department I.—Accounts. All disbursements are made by the Disbursing Clerk of the Department of the Interior. Estimates for supplies and the general care of contracts and orders are included in the work of this department.

Department K.—Buildings and labor. Mr. Henry Horan, superintendent, in charge. In this department are included the care of police and inspection, mechanics and labor, construction and repairs, cleaning and public comfort, heating and lighting.

Department L.—Electric service. In this department are embraced the telephone service, time service, burglar-alarm service, and watch-clock service.

Department M.—Preparation. This department is divided into several sections, each of which is in charge of a preparator, and is thoroughly discussed in another portion of this report.

Exposition staff.—In addition to the regular administrative staff of the Museum, an administrative staff for exhibition work has been maintained since July, 1882, under the general charge of the Assistant Director. Mr. R. Edward Earll is the executive officer, and Mr. W. V. Cox financial clerk of the staff, which is increased from time to time as occasion requires by the employment of extra clerks and preparators, and to which also, when necessary, are detailed various officers of the Museum scientific staff. In addition to the exhibition work of the year elsewhere referred to, this staff is still engaged in the preparation of a report upon the International Fisheries Exhibition at London, in 1883.

C.—THE CONDITION OF THE COLLECTIONS.

The custodianship of the specimens of the several departments has been conscientiously fulfilled by the curators with the assistance of the various preparators. I am confident that the material in the possession of the Museum has never been in better condition than it is at the present time.

9. A PROVISIONAL CENSUS OF THE COLLECTIONS.

*Estimated number of specimens now in the several departments of the National Museum.**

			No. of specimens.
Department of Arts and Industries:			
(*a*) Materia medica			4,442
(*b*) Textile industries			2,000
(*c*) Fisheries			5,000
(*d*) Animal products			1,000
(*e*) Naval architecture			600
(*f*) Foods			1,580
Department of Ethnology			200,000
Department of Antiquities			45,252
Department of Prehistoric Pottery			12,000
Department of Mammals	Skins and alcoholic specimens	5,694	9,908
	Skulls and skeletons	4,214	
Department of Birds			50,350
Department of Birds' Eggs			40,072
Department of Reptiles and Batrachians			23,495
Department of Fishes			68,000
Department of Comparative Anatomy (department not organized)			3,000
Department of Mollusks			400,000
Department of Insects			150,000
Department of Marine Invertebrates			200,000
Department of Invertebrate Fossils (Paleozoic)			73,000
Department of Invertebrate Fossils (Mesozoic and Cenozoic)			100,000
Department of Plants, fossil and recent			7,291
Department of Mineralogy			16,610
Department of Lithology and Physical Geology			18,000
Department of Metallurgy and Economic Geology			40,000
Total			1,471,000

10. ASSIGNMENT OF SPACE.

There has been made no material change in the assignment of exhibition space, as described on page 2 of my report for 1883. The northwest court will probably be opened during 1885 with the collections of North American pottery. The exhibition space for the collections of the metallurgical department will shortly be increased by the opening of the southwest court.

In the Smithsonian building the four main halls are occupied as they were in 1883, and as follows: Main hall, Ornithology; upper main hall, Pre-historic Archæology; west range, Ichthyology; west hall, Invertebrates.

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*These estimates do not take into account the actual number of specimens, but refer to "lots" of specimens, which may include one or several hundred, but which are included in a single entry of the Museum register.

The south galleries of the Smithsonian main hall have been cleared. the exhibition cases, which were old and unserviceable, having been taken down and used for other purposes, and the gallery spaces assigned for laboratory use. The southwest gallery is now occupied by the ornithological department for a work-room, and for storage of the great collection of unmounted bird-skins; the southeast gallery is similarly occupied by the conchological department.

The large room adjoining the northeast pavilion in the Museum building is now used as a depository for the oological collection, and as a laboratory for the section of birds' eggs.

The office of the Director of the Geological Survey having been removed elsewhere, the northeast pavilion is now occupied by the chemical and physical laboratory of the Survey. The southwest pavilion is being fitted up for the accommodation of the mammal, metallurgical, and mineralogical laboratories; the west balcony is used as a laboratory for ethnology; the north balcony for the department of textiles, and the south balcony for plants, recent and fossil.

The photographer of the Geological Survey having vacated the rooms for several years occupied by him in the brick annex, second story, the workshop of the taxidermist attached to the department of birds has been transferred thither.

The Armory building, with its wooden annex, occupied jointly by the Museum and the Fish Commission, is still crowded with unassorted material belonging to the Museum collections.

In order to provide suitable accommodations for the preparators, in connection with the preparation of the exhibit for the three expositions of Cincinnati, Louisville, and New Orleans, and also to give much-needed space for packing the collections to be sent, it was deemed advisable to construct a wooden building east of the Museum building. On July 15 the work of breaking and leveling the ground was commenced. The annex is 150 feet long, 50 feet wide, and 50 feet high. The eastern end was assigned to the modeling department of the United States Geological Survey. The southwestern portion was occupied by the taxidermic force of the National Museum, and in the northwest part the packing and general exposition work was carried on. The cost of this annex was about $3,500, expended as follows:

Survey of location for building	$10 00
Construction	3,055 41
Plumbing	257 76
Steam-fitting	131 11
Drainage	60 00
Total	3,514 28

Two wooden sheds, one to be used as a poisoning-house for skins, &c., and the other for the preparation of the collection of building-stones for the New Orleans Exposition, were erected in July between the Museum and the Annex building.

The need of an additional Museum building is each year more seriously appreciated. Very many objects of great interest and requiring a large space for their accommodation have been promised by exhibitors at New Orleans, and it is a serious problem to know where these can even be stored, aside from the possibility of properly displaying them.

Extensive collections of alcoholic specimens are known to greatly endanger the safety of museum buildings and their contents, and most of the establishments in Europe have lately taken the precaution to construct separate buildings peculiarly adapted for the purpose. It is sincerely hoped that the application which was made at the last session of Congress for an appropriation to put up a similar building in the grounds of the Institution will be acted upon favorably.

D.—REVIEW OF THE ADMINISTRATIVE WORK OF THE YEAR.

11. ACCESSIONS TO THE MUSEUM.

The total number of packages recorded by the registrar during the year was 5,507. In addition to this number, 209 wagon-loads of boxes, packages, &c., were received and distributed to the several departments. Of the entire number, 3,509 packages, boxes, &c., were addressed to the National Museum and its officers, the remainder being intended for the Smithsonian Institution and the United States Fish Commission.

The registrar of the Museum acts also in the capacity of transportation clerk for the Smithsonian Institution, and much material passes through his hands with which this report has no concern. The total number of individuals and institutions sending collections to the Museum, as shown in the list published in the appendix to this report, is 1,084.

It should be stated that very many of the objects sent in by the correspondents of the Museum are of very little value, and are transmitted simply for the purpose of obtaining a report upon their names and character. It has been the policy of the Smithsonian Institution to receive all objects offered which have any relation to its work, since the majority of such contributions, after they have been identified and studied, are valuable for exchange or distribution to museums and institutions of learning, and often prove to be of unexpected importance. Many of the specimens sent in for examination and report are entirely useless. It is hardly proper, therefore, to consider each one of the 3,500 packages received as constituting an important contribution to the collections. Many of them, however, contain specimens of great value.

The Museum has, during the past year as in previous years, received accessions from the following sources:

(*a*) By gift from correspondents.

(*b*) By exchange with institutions at home and abroad.

(*c*) By the deposit of the collections of the various surveys and Government departments which here find their legal repository.

(*d*) From the work in connection with the several expeditions.

(*e*) As a result of the explorations carried on under the patronage or with the co-operation of the Smithsonian Institution and Museum.

Mr. John Durand has rendered efficient service in negotiating exchanges with European museums.

Every important accession is fully described in the reports of the several scientific departments.

12. PROGRESS IN CLASSIFICATION AND ARRANGEMENT.

(*a*) *Laboratory work and catalogue entries.*

By "laboratory work" is meant the work of the curators upon the collections in their special apartments, which are not open to the public. Here the collections are received, unpacked, classified, identified, and catalogued; here also it is determined whether specimens should be placed in the exhibition series; or, if not thus assigned, whether or not they are sufficiently important as material for investigation in the study series, or should be called "duplicates" and distributed to other institutions.

The efficiency of the Museum work depends, in a large degree, upon the facilities which are afforded to curators for careful and thorough work in the laboratories. It is here that the specimens are indelibly marked with the catalogue number, upon which all future authentications depend. Here also must be prepared the labels, upon which the value of the exhibition series to a great extent depends; and here are prosecuted the scientific investigations, which, through the publications of the Museum, establish the reputation of its scientific staff for thorough and accurate work. The laboratory accommodations are being improved, but still there is much to be desired in respect to space, number of clerical assistants, and facilities for the use of books and instruments and other appliances.

In a museum, as in a temporary exposition, the efficiency of each department depends also upon the energy and constant presence of a thoroughly competent head, and consequently upon the opportunities afforded him for good work in his laboratory.

The present organization of the Museum is of such recent date that nearly all the curators are still embarrassed by the accumulations of past years, and the greater portion of their time is necessarily devoted to unpacking and overhauling the unclassified material which they found already on hand when they assumed the duties of their present offices. These heritages from the past will soon be under control, and it may be expected that our next year's report will show a great increase in the amount of work directly concerned with the preparation of the exhibition series, of final labels, of catalogues and hand books, and the prosecution and publication of original researches.

The activity of 1884 may best be gauged by the following table, which shows the total number of entries made in the Museum registers of the several curatorships:

No. of dept.	Name of department.	No. of entries during 1884.	No. of dept.	Name of department.	No. of entries during 1884.
I	Arts and Industries (general)	4, 429	XI	Marine Invertebrates:	
	Materia Medica	398		Crustacea	2, 924
	Textile Industries	1, 683		Worms	151
	Foods	420		Tunicates and Bryozoa	89
	Historical Relics	200		Radiates	1, 858
II	Ethnology	1, 184		Protozoa and Sponges	645
IIIa	Antiquities	4, 367		Invertebrate Fossils (Paleozoic)	564
IIIb	American Prehistoric Pottery	603		Invertebrate Fossils (Mesozoic Cenozoic)	1, 159
IV	Mammals	711			
Va	Birds	8, 142	XIIa	Fossil Plants	97
Vb	Birds' Eggs	3, 222	XIIb	Mineralogy	2, 307
VI	Reptiles	584		Lithology	2, 541
VII	Fishes	3, 015	XIII	Metallurgy	11, 021
VIII	Comparative Anatomy	547	XIV		
IX	Mollusks	5, 231	XV	Total	58, 195
X	Insects	53	XVI		

(b). *Development of the exhibition and study series.*

The "reserve series" in the Museum includes all the specimens which are retained for purposes of study, the exhibition series consisting of objects which are suitable to be exposed to public view in glass cases, selected from the reserve series of which it forms a part. The study series is formed by the residue, which are kept compactly stored either in cases in the laboratories or in the closed tables which serve as pedestals for the smaller show-cases in the exhibition halls.

The study series for any special group may generally be largely reduced in extent after an exhaustive monograph has been published upon that group, it being the long-established policy of the Museum to reserve only a sufficient number of specimens to permit the author of such monograph to entirely rewrite it, should the manuscript of his essay be destroyed.

Much progress has been made during the year in many departments in the work of separating the duplicate from the reserve series, and in many of the others in the work of preliminary classification, which is the necessary preparation for this task. The development of the exhibition series is necessarily slow, since it is not considered desirable to place on exhibition specimens which are not fully explained by printed labels. It is, to be sure, often necessary to expose to view large objects which have not been labeled. The extent and nature of the work of the Museum is not appreciated by persons who are not familiar with the character of the laboratory work and who have not access to the reserve stores. In the various departments of ethnology and industrial art, for instance, the wealth of the Museum is exceedingly great, but until cases have been built and labels printed it is impossible properly to display it.

Although very much has been done for the development of the exhibition and study series, it is certain that during the years 1885 and 1886 the Museum will improve in attractiveness to the visitor and general student, and in convenience to the investigator and special student, to a degree which has not in past years been in any way approximated.

The exhibition series has been greatly extended during the year by the work which has been done for the several expositions, numerous specimens having been mounted and labeled, which after their return may be placed at once on exhibition. Many objects have been acquired especially for use in this exposition work, which are equally desirable for the regular exhibition work of the Museum.

During this year, special improvements have been noted in the exhibition halls devoted to mineralogy, lithology and physical geology, metallurgy and economic geology, textile industries, fisheries, and naval architecture.

(c) *Construction of cases.*

It is hardly necessary to remark that no part of the work of the Museum at present occupies so much of my attention as the construction of cases, since the supply at present on hand is far from adequate to our needs. The "furniture and fixtures appropriation" which Congress has made annually since 1880 permits each year the building of a large number of cases. At the same time the capacity of the Museum building, with its laboratories and work-rooms, is exceedingly great, and up to the present time certainly not more than one-half of the requisite amount of case room has been obtained. In my previous report was given a statement of the number of cases in the Museum at the beginning of the year 1883. Appended is a list of the cases added during the year 1884:[*]

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[*] Case C:

(1.3) Door-screen cases, 8.6 by 1.3 by 7	10
(2.2) Door-screen cases, 8.6 by 2.2 by 7	10
(9 in.) Door-screen cases, 8.6 by 9 in. by 7	1
Case D:	
(1.3) Sliding-screen cases, 8.6 by 1.3 by 7	10
(2.2) Sliding-screen cases, 8.6 by 1.3 by 7	10
(2.6) Sliding-screen cases, 8.6 by 1.3 by 7	4
Case F:	
Fold-screen cases (half pillar)	10
Fold-screen frames	300
Slope-top cases	55
Slope-top cases	6
Case H:	
Table upright cases	10
Table upright cases	6
Case I:	
Unit-table cases	40
Unit-table cases	12

The names by which these cases are designated will of course be unintelligible to those who are not familiar with the nomenclature adopted in the Museum. Our system of case construction, which has been briefly discussed in previous reports, is entirely different from that in use in any similar establishment, and is admitted to be unusually economical and effective. We are constantly called upon by the officers of other museums for descriptions and working drawings. I have in preparation, and hope to present in the report for 1885, a full description, with illustrations, of the various methods of installation which have been adopted.

The main features of the plan are as follows: The cases are, as a rule, of mahogany, finished in the natural color, and have been constructed in accordance with artistic plans furnished by Mr. William Bruce Gray. Their chief recommendations are the following: (1) the building consisting practically of a single large hall; the cases are so constructed that they.may placed between any two adjacent pilasters, and thus form partitions dividing this hall into seventeen halls of lesser extent; (2) the cases are all of one length, 8 feet 8 inches,* which is the architectural unit of the Museum building, or are of such lengths that, combined together, they always conform to this unit, so that they are interchangeable; (3) the construction is such that, with very slight expenditure of labor, any one of them full of specimens can be transported from one part of the building to another, thus allowing great freedom in the matter of rearranging the Museum; (4) all the smaller specimens are mounted in groups upon small tablets or in glass-covered boxes of uniform size, which can be handled with great facility, and which afford great security to the specimens, and diminish immensely the labor of properly caring for them; (5) the objects are displayed against backgrounds which at the same time afford the greatest ease to the eye of the visitor and the greatest relief and effectiveness to the object dis-

Unit-table cases (terraced section)	14
Table-top cases (movable)	20
Case J. Unit drawers	1,386
Case K. Unit boxes	210
Case L. Wall upright cases, 10 by 10 by 9	1
Case M. Salvin bird cases	4
Case O. Basement drawer storage cases	21
Case P. Sectional library cases	6
Case S:	
Quarter unit-table cases	20
Kensington cases	20
Costume cases	1
Card catalogue cases	7
Manuscript cases	2
Manuscript drawers	421
Anatomical cases	1
Franklin press case	1

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*As a matter of fact, the cases are made a little scant in length, to provide for convenient handling; they actually measure about 8 feet 6 inches.

played; (6) the objects being shown singly against a suitable background, and at the same time brought as close as possible to the glass front of the case, the sense of confusion, so often experienced in museums, is entirely avoided; (7) the labels are printed in large, heavy-face type and upon paper of soft tints, which are much less wearisome to the eye than the ordinary labels in black and white.

Important additions of storage cases and furniture have been made to the laboratories of several of the curators, and all the laboratories are now better supplied than ever before. The storage cases in some of these departments are built in four sections in height, occupying only the same floor space as the one-section cases and accommodating four times the quantity of specimens. Each curator is supplied with a light ladder, affording easy access to the upper sections.

The laboratories in which the greatest improvements have been made during the year are those of birds, fishes, mollusks, insects, invertebrate fossils, fossil plants, lithology and physical geology, minerals, and metallurgy and economic geology. The following statement shows the number and kind of storage cases and other furniture at present in use in the various laboratories

Ethnology:	
Unit tables	14
Sectional library cases	1
Standard pigeon-hole stack	1
Quarter tables	12
Card catalogue cases	2
Mammals:	
Sectional library cases	1
Standard shelf-stacks	3
Standard pigeon-hole stacks	4
Quarter tables	6
Birds:	
Salvin bird cases	16
Sectional library cases	4
Standard pigeon-hole stacks	1
Quarter tables	29
Fishes:	
Sectional library cases	8
Card catalogue cases	1
Mollusks:	
Basement-drawer storages (1 containing 2 tiers; 4 containing 3 tiers)	5
Insects:	
Sectional library cases	11
Quarter tables	2
Marine invertebrates:	
Sectional library cases	3
Standard pigeon-hole stacks	2
Quarter tables	4
Card catalogue cases	1
Fossil invertebrates (Paleozoic section):	
Basement drawer storages (1 containing 3 tiers; 1 containing 4 tiers)	2
Sectional library cases	2
Quarter tables	13

Fossil invertebrates (Mesozoic and Cenozoic section):	
Basement drawer storages (1 containing 1 tier; 2 containing 3 tiers; 1 containing 5 tiers)	4
Sectional library cases	4
Standard shelf-stacks	2
Quarter tables	1
Fossil plants:	
Unit tables	4
Basement drawer storages (1 containing 2 tiers; 1 containing 4 tiers; 2 containing 3 tiers)	4
Sectional library cases	1
Quarter tables	11
Lithology and physical geology:	
Unit tables	1
Basement drawer storages (containing 4 tiers)	1
Sectional library cases	1
Standard shelf-stacks	4
Standard pigeon-hole stacks	6
Quarter tables	4
Minerals:	
Basement drawer storages (1 containing 4 tiers; 2 containing 8 tiers; 1 containing 9 tiers)	4
Standard pigeon-hole stacks	1
Metallurgy and economic geology:	
Basement drawer storages (containing 4 tiers)	1
Sectional library cases	1
Standard pigeon-hole stacks	5
Quarter tables	1
Card catalogue cases	1
Materia medica:	
Basement drawer storage (containing 2 tiers)	2
Sectional library cases	1
Standard shelf-stacks	14
Card catalogue cases	1

The number of unit-drawers in use now exceeds 10,000.

(*d*) *Preparation of labels.*

During the year 1884 about 4,500 descriptive labels for the exhibition series were printed, besides several thousand forms of labels for the reserve and duplicate collections in the various departments. This has been accomplished through the courtesy and co-operation of the Secretary of the Interior. Much progress has been made toward labeling the exhibition series, particularly in the departments of Building Stones and Materia Medica, the labeling of collections in those departments being now practically completed. Many of the labels printed were for the objects sent to the expositions.

No changes were made in the general form of the labels. Slight modifications were in some cases necessary, in order to adapt the labels to special collections.

Large general labels, as also labels for some special collections, are printed upon a small press kept for the purpose in my office, while the bulk of the descriptive labels are, as a rule, printed by the Interior Department. During the year 1884, however, the Museum office printed about 2,000 labels, or nearly one-half of all that were printed. These were chiefly labels for the collections sent to the expositions.

Of each descriptive label there are twenty copies printed, ten on cardboard (gray or herbarium) and ten on white paper; the former to be shown with the objects and for the reserve file, and the latter for making catalogues of the collections and for general distribution to donors and to other museums. The labels printed for the Fisheries collections which were sent to the London Exhibition in 1883 have been reprinted in Bulletin 27 of the Museum, and form a complete index to the numerous objects of fishing implements and vessel models composing the collections.

The care of the labels requires the entire time of one man. As soon as received from the printer, a sample of each label is put in the scrap-book series, as many as are needed for immediate use are sent to the curator in charge of the collections, and the remainder of the labels are filed in unit drawers, where they are arranged numerically by departments. An index is kept, by means of which a label, designated by its number, can be referred to at once in the scrap-book and files.

13. PROGRESS OF GENERAL AND INCIDENTAL WORK.

(a) *Library.*

During the past year the usefulness of the library has been gradually increasing, although no very important additions have been received. The additions for the year numbered about 700 books and pamphlets, including many works of permanent value and practical utility. Few purchases have been made, the principal sources of growth being through exchange, gift, and deposit. The various departments of the Government, especially those engaged in scientific research, have made many valuable contributions. The trustees of the British Museum have presented a large series of the catalogues and regular publications of that institution. Progress has been made during the year in the effort to classify systematically the books in the library, but the work has been greatly retarded owing to the insufficient force. The classification referred to is absolutely necessary for the proper administration of the library, and it is hoped that it may soon be practicable to provide adequate means for this purpose.

The library system may be briefly described, as follows: In the central library are retained all books treating of more than one subject, such as periodicals, proceedings of societies, serial reports, dictionaries, and cyclopedias, together with such monographs as are not desired in the sectional libraries, which are in the several Museum laboratories under the charge of their respective curators. To the sectional libraries are assigned only those works which relate directly to the work of the section. Books in the sectional libraries are considered to be personally loaned to the curators in charge.

All books and other matters are first entered at the central library, and the necessary acknowledgment made, after which monographic works, upon application, are sent to the sectional libraries, their assignment being designated upon the card catalogue.

It is very evident that the efficiency of the curators, not only in the proper handling of the collections, but also in the preparation of the scientific reports, which constitute so prominent a feature in the work of the Museum, depends upon the completeness of the Museum Library. A certain sum should be set aside for the purchase of books, since many of those which are most needful cannot be obtained by exchange. The entire appropriation has hitherto been needed for the payment of salaries and the construction of cases, and for all books which have been bought the Museum is indebted to the Smithsonian endowment fund.

(*b*) *Distribution of duplicates and exchanges.*

The following table represents the number of boxes and packages of specimens distributed to museums and colleges, and in exchange with correspondents during the year, viz:

	Boxes and packages.
Mammal skins and skeletons	13
Birds' skins, nests, and eggs	86
Minerals	21
Reptiles	10
Marine invertebrates (in sets)	48
Marine invertebrates (miscellaneous packages)	34
Fossils	11
Pottery	7
Indian relics	17
Fishes	10
Crania	1
Plants	16
Casts (plaster)	9
Rocks	2
Shells	4
Woods, etc	1
Materia medica	3
Total	293

The number of specimens contained in these boxes and packages amounts to 21,084. This table shows an increase in the work of this department, there having been distributed this year nearly 5,000 specimens more than in 1883.

During the year, 103 applications from museums, schools, and individuals in the United States for general natural history specimens have been filed, and a large number of these have been filled.

The number of packages of all kinds shipped to the New Orleans, Louisville, and Cincinnati Expositions amounted to 819.

In the report of the Department of Marine Invertebrates will be found a detailed list of the institutions to which the Fish Commission sets of duplicates of marine invertebrates were distributed during the year. References to the various exchanges made are also reported on by the several curators. A tabulated exhibit of what the Museum has done in the way of distributing its duplicates from the commencement of its history is very desirable, and will probably be prepared in time for the next report.

(c) *Publications.*

A complete list of the publications of the National Museum for 1884 is given in Appendix B, Part IV. During the year the last five signatures of Vol. VI and the first thirty-one signatures of Vol. VII appeared. Proceedings United States National Museum for 1883, Vol. VI, consisting of 558 pages and 14 plates, were published.

Bulletin No. 25, including seven parts, and forming Vol. I of Contributions to the Natural History of the Bermudas, and Bulletin No. 27, consisting of twelve parts and constituting a report upon the exhibit of the United States at the London Fisheries Exhibition, 1883, were printed.

Eight Museum circulars were printed as separates. These, including Nos. 24–31, will appear in Vol. VIII, Proceedings United States National Museum.

In Appendix B, Part IV, will be found a bibliographical list of the papers published during 1884 by officers of the Museum. These papers number 229 and are distributed among the several departments as follows:

	Papers by officers of the National Museum.	Papers by other investigators.	Total.
Arts and industries (including 26 papers on fisheries and fish culture)	30	1	31
Ethnology	20	3	23
Antiquities	8	1	9
Mammals	7	4	11
Birds	42	17	59
Birds' eggs	1	....	1
Reptiles and Batrachians	2	2	4
Fishes	29	32	61
Mollusks	9	1	10
Insects	25	2	27
Marine Invertebrates	5	5	10
Invertebrate fossils	9	1	10
Plants:			
Fossils	3	....	3
Recent	3	2	5
Mineralogy	2	....	2
Lithology and physical geology	11	1	12
Geography and exploration	19	3	22
Chemistry	7	....	7
Physiology and histology	6	1	7
Taxidermy	4	....	4
Bibliography	1	....	1
Administration	15	....	15
General	1	....	1
Total	259	76	335

In Part IV is a list of 76 papers based upon Museum material, written by investigators other than officers of the Museum.

(*d*) *Visitors.*

During the year the number of visitors to the Museum building has been 195,322, and to the Smithsonian building 91,130. The total number of visitors may, therefore, confidently be placed at considerably more than 200,000.

It may be noted that the interest of visitors in the collections appears to be increasing in full proportion to the progress which has been made in affixing descriptive labels.

The doorkeepers still continue the use of the automatic registers, which are proving much more satisfactory than the turnstile system usually employed in museums and exhibitions. The result of their record is given below in tabulated form.

Number of visitors to the Museum building for 1884.

Month.	Number of visitors.	Number registered.
January	15,114	2,207
February	21,215	3,321
March	20,832	2,938
April	21,527	3,092
May	25,484	3,716
June	11,947	1,486
July	13,671	1,516
August	17,698	1,838
September	13,263	1,645
October	12,456	1,520
November	10,515	1,223
December	11,600	1,380
Total	195,322	25,882

Number of visitors to Smithsonian building, 1884.

Month.	Number of visitors.	Number registered.
January	7,007	1,029
February	8,781	1,353
March	7,743	1,193
April	8,012	1,243
May	10,319	2,098
June	6,379	1,024
July	6,892	997
August	10,883	1,442
September	6,945	1,072
October	7,116	796
November	5,310	702
December	6,243	930
Total	91,130	13,879

Number of visitors to United States National Museum and Smithsonian Institution for 1882, 1883, *and* 1884.

Year.	Museum building.	Smithsonian building.
1881	*150,000	....
1882	†167,455	152,744
1883	202,188	104,823
1884	195,322	91,130

*Estimated on basis of register.

† Estimated on basis of attendance from February 8 to December 31.

e) Students and lectures.

Reference has been made in previous reports to the arrangement by which, at the request of the Navy Department, the Institution received for three successive years six ensigns, and assigned them to duty in various sections of the National Museum for the purpose of enabling them to become acquainted with certain branches of science, such as chemistry, mineralogy, geology, ethnology, general natural history, &c., in order that in their subsequent cruises they might be more useful. Three details of the kind have been made, none, however, in 1884, the Department having found it inexpedient to continue the arrangement. Most of the gentlemen already detailed have also been reclaimed and assigned to duty. Two of these ensigns, Messrs. Miner and Garrett, are now on the Fish Commission steamer "Albatross." Ensign Hayden was detached in October and ordered to duty, first at the Cambridge Observatory, and subsequently to the United States Geological Survey.

The experiment in connection with these junior officers of the Navy has been very satisfactory as far as it has gone, and there can be no doubt that the increased range of information thus acquired by the eighteen gentlemen so detailed will be utilized to a considerable extent in the future.

The Museum is frequently favored by visits of men of science from other countries for the purpose of special inquiry into its methods, and an unusual number of such callers was welcomed during the past year in connection with a meeting of the British Association in Montreal. Several distinguished naturalists took the occasion to study the collections of the National Museum, which they found to contain many important types otherwise inaccessible to them.

Permission has been granted during the year to a considerable number of students of art to make copies of specimens in the Museum, and an increase in the number of schools visiting the Museum in company with their teachers has been noticeable.

As in previous years, the use of the lecture room in the Museum on Saturday afternoon during the winter and spring has been granted to a joint committee of the Biological and Anthropological Societies of Washington for the purpose of conducting a course of scientific lectures. These lectures are usually in some way connected with the work of the Museum, and are illustrated by specimens from the collections. They correspond in character closely to the afternoon lectures given at the gardens of the Zoological Society of London.

The programme of the year is here appended:

FIRST COURSE.

January 5, Mr. Grove K. Gilbert: Cliffs and terraces.

January 12, Prof. Otis T. Mason: Child-life among savage and uncivilized peoples.

January 19, Prof. Edward S. Morse: Social life among the Japanese.

January 26, Maj. J. W. Powell: Win-tun Mythology.

SECOND COURSE.

February 2, Prof. F. W. Clarke: Lightning and lightning-rods.

February 9, Capt. C. E. Dutton, United States Army: The Hawaiian Islands and people.

February 18, Prof. John Murdoch: Eskimo life at Point Barrow.

February 23, Prof. Harvey W. Wiley: The sugar industry of the North.

THIRD COURSE.

March 1, Prof. Harvey W. Willey: The sugar industry of the North.

March 8, Prof. Simon Newcomb: Psychic force.

March 15, Mr. John A. Ryder: Protoplasm in the light of recent investigations.

March 22, Dr. Frank Baker: The new phrenology.

March 29, Dr. D. Webster Prentiss: The bird-life of the District of Columbia.

FOURTH COURSE.

April 5, Prof. T. C. Chamberlin: The great ice invasion of North America.

April 12, Dr. W. W. Godding: What shall we do with the inebriates?

April 19, Prof. J. S. Newberry: The industrial arts as factors in modern history.

April 26, Maj. J. W. Powell: The cañons of the Colorado.

The lecture room was occupied on March 19 for the delivery of the ninth lecture of the Toner series by Dr. Charles K. Mills, of Philadelphia.

(*f*) *Meetings of societies.*

The lecture hall of the National Museum has been used during the year for sixty-eight meetings of different kinds, as is shown below.

National Academy of Sciences, April 15–17: Ten meetings were held. On the evening of the 17th a public meeting was held, at which the eulogies of deceased members were pronounced, 176 persons being in attendance.

American Surgical Association, April 30–May 3: Eight meetings were held.

American Fish Cultural Association, May 13–15: Seven meetings were held. Invitations were extended by the Commissioner of Fisheries to the fish commissioners of nineteen States, and a large attendance was the result. Many papers were presented, but the chief point of attraction was the opening to the public of the fisheries section of the Museum, as arranged after the return of a part of the collection from the International Fisheries Exhibition in London. The Brush-Swan Company kindly furnished the lights to illuminate the entire building, especially the fisheries section, and a large number of visitors were present on the occasion. On the evening of May 13 a public meeting took place, Hon. Elbridge G. Lapham in the chair. The formal address was delivered by Hon. Theodore Lyman, of Massachusetts, who was followed by Hon. S. S. Cox, of New York, in a second address.

American Dental Association, July 22–23: Four meetings were held.

Society of American Taxidermists, July 30: One meeting was held.

Society of Naturalists of the Eastern United States, December 29–30: Four meetings were held.

The Biological Society of Washington: Fortnightly meetings were held between June 25 and May 31, and between November 1 and December 27. In all there were fifteen meetings.

The Entomological Society of Washington held three meetings in the office of the assistant director, on May 8, June 3, and November 3, respectively.

On January 11, permission was granted to members of the Argent Club, an association of amateur photographers, to hold their monthly meetings in the photographic laboratory of the Museum.

14. CURRENT ADMINISTRATIVE WORK.

(a) *Buildings and labor, police and public comfort.*

At the commencement of the year the administrative staff for police and inspection consisted of Henry Horan, superintendent of buildings, 2 assistant superintendents, 12 watchmen, and 5 doorkeepers; for construction, care of buildings, and repairs, 8 carpenters, 3 painters, and 1 mason; for labor and cleaning, 20 laborers, 2 attendants, and 4 cleaners. For heating and lighting there were employed 1 engineer and 4 firemen. The same system of Museum messenger-service as was adopted in 1883 is still in practice, and greatly facilitates the despatch of business between the offices of the divisions of administration and the officers and employés of the Museum. Two Museum messengers are now employed, it having been found impracticable for one to complete the round of the buildings within the necessary limit of time—one hour.

The following abstract of the report of Mr. Horan, the superintendent of buildings, is here presented, to give an idea of the manner in which the mechanics and laborers have been employed. The main features of the work mentioned by him and discussed elsewhere in this report form the standpoint of the general administration:

In the early part of January the exhibits of metals, ores, &c., transferred to the Smithsonian Institution at the end of the Centennial Exhibition in 1876 were brought into the Museum and assigned to their respective departments.

A great many heavy specimens were brought into the New Museum from the Smithsonian building during the early part of the year, including the Egyptian statuary, a pair of Haviland vases which were exhibited at the Centennial Exhibition, &c. Much time was also occupied during the first part of the year in shipping to their owners exhibits which had been sent to London in conjunction with the exhibit of the National Museum. For instance, seventeen boxes were returned to the Signal Office, fifteen boxes to the Light-House Board, &c.

Toward the end of January it was found necessary to add to the force two carpenters, two painters, four laborers, and one fireman. In February and April further additions were rendered necessary.

During the latter month two additional carpenters, one painter, one stone-cutter, and ten laborers were employed. On account of lack of convenient quarters, it was found necessary in April to clear out a portion of the southeast court for the use of painters. The extra force was discharged on May 21.

On the 14th of May the entire force of laborers was very busily engaged in making preparations for the opening of the fisheries section, which took place in the evening of that date. It had been necessary for several days previous to keep the men at work until midnight, and it was only by most strenuous efforts that the fisheries hall was ready for the visitors a minute or two before the appointed time.

On the 10th of July the work of preparation for the Louisville and Cincinnati Expositions was commenced. Three extra carpenters were employed. On this day the construction of a workshop was begun in the grounds east of the Museum building for the use of the stone-cutters, and a few days later the ground was broken for the erection of an annex building, it having been found that the preparations for these expositions demanded more space than could possibly be found in the Museum building. This annex was finished on August 4, and the taxidermist's laboratory was immediately removed to it from the Museum building. A portion of the annex was alloted to the Bureau of Ethnology. On the 5th of August all the ethnological specimens in the northeast court were taken to the new building.

On August 6 the work of packing the Louisville exhibits was commenced in the northeast court, and on August 12 two car-loads, containing 112 packages, were shipped to the exposition. On the following day the superintendent left Washington for Louisville for the purpose of assisting in the reception and arrangement of the exhibits.

On August 26 two car-loads of exhibits, numbering 76 packages, were shipped to the Cincinnati Exposition, and the superintendent was also requested to go there and render similar assistance. During this month the force of laborers and mechanics was kept unusually busy, and at the end of the month the extra hands were all discharged.

On the first of September a small frame building was erected east of the stone-cutters' house for the purpose of poisoning skins, &c.

In the middle of October the National Museum received from the Botanical Gardens some very fine tropical plants, which have been placed around the fountain in the rotunda. Smaller plants were also arranged on the four balconies overlooking the rotunda. These plants have added very much to the appearance of the Museum.

On November 24 the work of shipping the exhibits intended for the New Orleans Exposition was commenced. On the 30th the superintendent left for New Orleans, in order to help in the arrangement of specimens.

The preparation of the exhibit for New Orleans necessitated a large addition to the force of mechanics and laborers, and during July 31 names were added to this roll, distributed as follows: 4 carpenters, 1 painter, 4 masons, 10 laborers, and 12 aids, assigned to various departments for special duty. In August this force was increased by 4 painters, 1 brass finisher, 1 laborer, and several aids.

During the absence of the superintendent at Cincinnati, Louisville, and New Orleans, Mr. C. P. Crandell acted in his place. On account of sickness Mr. Crandell was forced to temporarily resign his duties, and Mr. C. A. Steuart was then placed in charge.

(b) *Electric service.*

There have been no important additions to this service during the year, and a statement of the electrical apparatus now in use in the

National Museum will be found under this heading in the report for 1883.

The Superintendent of the United States Naval Observatory has included the Smithsonian building and that of the National Museum in the series of public establishments which receive telegraphic time at noon on each successive day, and a clock, fitted up under the direction of the Observatory, with an arrangement by which the Observatory itself corrects any aberration in time, has been supplied. The money expense has been borne by the Institution, but no charge has been made for the time service.

Through the courtesy of Colonel Rockwell, Superintendent of Public Buildings and Grounds, connection has been made with the underground telephone laid by his authority through the public grounds by the Waring Company. A special advantage in this was the opportunity of making a more satisfactory connection between the National Museum building and the United States carp ponds, a service that previously had been much interrupted. Connection was also made through the same trench with the Fire Alarm Telegraph Company, and the necessary permission to open North B street was promptly granted by the District Commissioners.

(*c*) *Property and supplies.*

The property clerk has, as hitherto, been in charge of and held responsible for all articles of furniture, and, in general, all Museum supplies, and has been required to inspect the same and report upon them to the Assistant Director. It is also his duty to keep in hand a stock of such articles as are in most general use, issuing the same to any person who presents a requisition duly endorsed. He is also required, when necessary, to buy special articles, whose purchase has been duly approved.

It is the duty of the property clerk to see that in the purchase of goods two points are especially attended to, viz: quality and price. If the cost of an article will probably exceed $10, the property clerk is required to obtain estimates from several reliable dealers.

(*d*) *Accounts.*

Owing to the continued ill-health of Mr. George S. Hobbs, who had been in charge of this department, it was found necessary to relieve him of official duties, and on July 13 Mr. H. W. Spofford was engaged to fill his place temporarily, and also to assist Mr. William V. Cox, who was acting as financial clerk on the special exposition staff.

The administration of the Museum accounts has been carried on, as heretofore, under the direction of the chief clerk of the Smithsonian Institution, and all payments have been made through his office. A statement of the receipts and expenditures of the Museum will be found, as usual, in the report of the executive committee of the Board of Regents of the Smithsonian Institution.

(e) *Chemical analysis of the air in the lecture room.*

On several occasions it has been remarked that the air in the lecture room became exceedingly oppressive during the progress of meetings, lectures, &c. In order to verify these statements, Dr. J. H. Kidder, of the United States Fish Commission, was requested by Professor Baird to analyze the air during the progress of some of the Saturday afternoon lectures. Dr. Kidder's notes are here given in full:

ESTIMATION OF CARBON DIOXIDE IN THE LECTURE HALL OF THE NATIONAL MUSEUM.

MARCH 1, 1884.

The hall is at the northwest angle of the building and measures 91⅓ by 49⅔ feet by 28¾ feet mean height.

		Cubic feet.
Total cubical contents		130,279.7
Less space occupied by 500 persons (in cubic feet)	1,500	
Less space occupied by screens and seats (in cubic feet)	1,000	
		2,500.0
		127.779.7

The lecture began at 3.30 and continued for three-quarters of an hour; most of the audience were present for a full hour. Its number, as estimated by the superintendent, was about 500. The hall had been scrubbed and ventilated as well as possible (but very imperfectly) during the day, and the screens freshly painted.

Out-door air was damp and cold, slightly below the freezing point. Air of lecture hall, at 9 feet from the floor, about the middle of the hall, was as follows:

	Dry bulb.	Wet bulb.	Relative humidity (100=saturation).
One hour before lecture	61°	56°	72°
At close of lecture	65	58	83

Floor scarcely dry at beginning of lecture.

Carbon dioxide.—Eighty-six feet of rubber hose, one-quarter inch inside diameter, were washed for two hours by a continuous stream of tap water and strung upon the gas fixtures from a point 8 feet from the floor, near the center of the hall, to the uppermost room of the northwest tower. Air was pumped by aspiration through this tube from the hall, and after the residual air in the tube had been displaced, was collected in close bottles and examined, with the following results:

	Parts CO_2 per 10,000
March 1, half an hour before lecture	8.67
March 1, half an hour after beginning of lecture	12.22
March 1, air of experiment room	13.04
February 29, out-door air (4 p. m.)	3.97
March 3, out-door air through tube	5.54

The last estimation was intended to eliminate errors arising from impurities possibly derived from the long and narrow tube through which the air was collected. Since the out-door air in the afternoon has been found by numerous estimations not to vary materially from the normal average of 4 parts per 10,000, the correction due to the tube becomes 1.14, and the corrected results are as follows:

	CO_2 per 10,000
Lecture hall half an hour before beginning of lecture	7.53
Lecture hall half an hour after beginning of lecture	11.08
Experiment room during lecture	13.04
Mean of outside air	4.00

If the hall had been an absolutely closed box, the increase in carbon dioxide due to the presence of 500 persons would have been about 300 cubic feet. The quantity observed (supposing the specimen to have been a fair sample of all the air in the hall) was 45 cubic feet, or about one-sixth of the possible increase.

Specimens were also taken for estimation of organic matter and other contents of the air, but are not to be depended upon as tests because of the length and narrow caliber of the collecting tube; since both solids suspended in the air and ammonia tend to adhere to surfaces, and particularly to moist surfaces.

So far as carbon dioxide can be accepted as an indication of contamination in air, these observations do not show an unwholesome condition of the air of the lecture room, but do indicate insufficient ventilation. For exact conclusions, specimens should be taken near the floor, near the ceiling, and about ten feet from the floor, at the beginning and end of the lecture, and compared with one another and with the outside air. Larger pipes, of metal, should be used for collection, unless specimens can be taken in the hall itself; and estimations of ammonia, both free and "albuminoid," should be made in addition to those of carbon dioxide.

FURTHER EXAMINATIONS OF AIR OF LECTURE ROOM.

MARCH 6.

An average of ten persons present. Outside air damp—melting of a heavy snowfall.

Time.	Dry bulb.	Wet bulb.	Relative humidity (100=saturation).
12.20 p. m.	58°	55°	81 in laboratory.
12.40 p. m.	65	59	68 in lecture hall.
4 p. m.	69	64	75 in lecture hall.
4.10 p. m.	52	48	74 out of doors.

Carbon dioxide:

1 p. m., outside air, 4.6 CO_2 per 10,000 parts.

12.40 p. m., lecture hall, 10.04 CO_2 per 10,000 parts.

MARCH 8.

Out doors rainy. Lecture began at 3.30 p. m.; 700 persons present.

Time.	Dry bulb.	Wet bulb.	Relative humidity.
1.00 p. m	62°	58°	77 in laboratory.
1.20 p. m	45	44	93 out doors.
2.30 p. m	69	64	75 lecture hall, before lecture.
5.00 p. m	74	70	81 lecture hall, after lecture.

Carbon dioxide:

Mean of out-door air, 4. per 10,000.

3 p. m., lecture hall, 9.086 per 10,000, one-half hour before lecture.

4.15 p. m., lecture hall, 12.505 per 10,000, three-quarters of an hour after beginning lecture.

Persons present declared the air to be more oppressive than on March 1, but the figures show no material difference.[*] The highest essential impurity (as measured by carbon dioxide) appeared on March 6, when there was no lecture, and it is probable that if there had been a lecture on that day the highest figures for contamination by respiration would then have appeared.

Summarizing the several observations, they result as follows:

March 1. Temperature increased 4° F. during the lecture.

March 1. Relative humidity increased 11 per cent. during the lecture. (Floors had been wet before lecture.)

March 6. Temperature increased 4° during four hours in lecture hall.

March 6. Relative humidity increased 7 per cent. during four hours. (No lecture.)

March 8. Temperature increased 5° during lecture.

March 8. Relative humidity increased 6 per cent. during lecture.

March 1, CO_2 exceeded outside air 3.53 per 10,000 before lecture.

March 1, CO_2 exceeded outside air 7.08 per 10,000 middle of lecture.

March 6, CO_2 exceeded outside air 5.44 per 10,000 at 1 p. m. (No lecture.)

March 8, CO_2 exceeded outside air 5.086 per 10,000 before lecture.

March 8, CO_2 exceeded outside air 8.505 per 10,000 near end of lecture.

If this excess be all attributed to respiratory impurity, it has exceeded "the maximum amount of respiratory impurity permissible in a properly ventilated space" (Dr. Chaumont), viz, 2 parts per 10,000, by—

Parts per 10,000 before lecture March 1	1.53
Parts per 10,000 half through lecture March 1	5.08
Parts per 10,000 no lecture March 6	3.44
Parts per 10,000 before lecture March 8	3.086
Parts per 10,000 three-fourths through lecture March 8	6.505

The *increase* due to respiratory impurity on the two lecture days of experiment, while the lecture continued, was:

March 1. In half an hour, 3.55 parts per 10,000.

March 8. In three-fourths of an hour, 3.419 parts per 10,000.

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[*] In the increase of CO_2 during the lecture.

The indication is that the ventilation is imperfect, not only during the lecture, but in the Museum generally, the permanent air showing at all times of examination too great an excess of CO_2 over that out of doors.

MARCH 10, 1884.

15. THE WORK OF THE MUSEUM PREPARATORS.

A number of additional preparators have been employed during the year, for special work upon the collections for the New Orleans Exposition, and an unusual quantity of objects for the exhibition series have been completed during the year in the workshops, as is shown in the review of the operations of the scientific departments.

(a) *Taxidermists.*

The main workshop, which is devoted chiefly to work upon the mammals, is under the direction of Mr. William T. Hornaday, chief taxidermist, and the general excellence of its work testifies to the efficiency of its staff. The preparation of the exhibit for the New Orleans Exposition added considerably to its work, and during the summer 83 specimens, representing 78 species, were mounted specially for the exposition.

During the year Mr. Hornaday and his assistants mounted 114 specimens, representing 91 species, and classified as follows:

Orders.	Specimens.	Species.
Primates	7	7
Chiroptera	17	16
Insectivora	1	1
Carnivora	33	28
Pinnipedia	1	1
Ungulata	5	5
Rodentia	38	27
Edentata	6	4
Marsupialia	6	2
Total	114	91

In addition to the work already specified, the skins of 57 mammals were removed and preserved. A collection of Australian fishes, consisting of 60 specimens, was repaired and repainted. Twelve fur-seals were repaired, and 24 large mammals were mounted on new pedestals. The large seal group, which had been sent to the Fisheries Exhibition in London in 1883, was reconstructed, and the collection of Ungulates renovated. Twenty-one specimens of birds, fishes, &c., were mounted, and two groups of small mammals made and set up.

By an omission in the records of last year the Museum failed to make acknowledgment to Mr. Hornaday for his gift of a mounted setter, valued at $250, and to certain members of the Society of American Taxidermists for some 25 objects presented to the National Museum.

LIST OF THE MAMMALS MOUNTED IN THE UNITED STATES NATIONAL MUSEUM DURING THE YEAR 1884.

PRIMATES.

14261. Cynopithecus niger.
14247. Cercopithecus ruber.
14290. Stenops tardigradus.
14309. Ateles ater.
12129. Sapajou melanochir.
14230. Cebus capucinus?.
14338. Chlorocebus engythithea.

CHEIROPTERA.

6997. Atalapha cinerea.
7839. Natalus stramineus.
13376. Anthrozous pallidus.
7779. Noctilio leporinus *var.* mastivus.
14262. Molossus rufus.
5201. Vampyrus spectrum.
14411. Artibeus perspicillatus.
6980. Artibeus cinerea.
11206. Artibeus planirostris.
5418. Sturnia lilium.
13952. Vesperugo noctivagans
7011. Artibeus, sp.

INSECTIVORA.

2211. Scapanus Townsendi.

CARNIVORA.

14312. Felis concolor.
7812. Felis onza.
3573. Canis lupus griseo-albus.
14570. Canis latrans.
14423. Vulpes fulvus argentatus.
14634. Urocyon virginianus.
14393. Urocyon virginianus littoralis.
13838. Vulpes japonicus.
13824. Nyctereutes procyonides.
14155. Gulo luscus.
7202. Putorius brasiliensis frenatus.
8008. Putorius erminea.
12671. Putorius erminea.
14545. Putorius vison.
Putorius vison. (With trap.)
13946. Mephitis mephitica.
14427. Mephitis putorius.
12545. Taxidea americana.
13836. Meles anakuma.
14155. Lutra canadensis.
13842. Lutronectes Whitleyi.
13822. Ursus japonicus.
13616. Ursus americanus? juv.
13832. Mustela melanopus.
13966. Procyon lotor.
Procyon lotor.
9068. Nasua narica.
8622. Nasua narica.
7033. Cercoleptes caudivolvulus.
14424. Bassaris astuta.
11902. Bassaris Sumichrasti.
14513. Viverra zibetha.
14366. Galidia olivacea.

PINNIPEDIA.

14021. Phoca fœtida.

UNGULATA.

14684. Bison americanus.
13991. Ovis, sp.
14116. Cervus columbianus.
14004. Cervus macrotis. (Head.)
13776. Elasmognathus Bairdii. juv.

RODENTIA.

14328. Sciuropterus volucella.
14329. Sciuropterus volucella.
14330. Sciuropterus volucella.
14341. Sciuropterus volucella.
14270. Sciuropterus volucella.
14271. Sciuropterus volucella.
Group.
13839. Pteromys leucogenys.
2349. Sciurus niger *var.* niger.
14429. Sciurus fossor.
12892. Sciurus hypopyrrhus.
12055. Sciurus æstuans.
9488. Sciurus cinereus.

RODENTIA—Continued.

9432. Sciurus aureogaster.
95. Sciurus, sp.
2482. Tamias striatus.
2477. Tamias asiaticus Townsendi.
9489. Tamias Harrisii.
7371. Tamias, sp.
2375. Sciurus carolinensis. (Albino.)
1445. Spermophilus Douglasii.
1323. Cynomys ludovicianus.
1913. Cynomys columbianus.
13957. Arctomys monax.
12654. Erithizon dorsatus epixanthus.
13621. Erithizon dorsatus epixanthus.
14148. Lepus timidus.
14413. Lepus californicus.
14460. Lepus americanus Washingtoni.
14348. Lepus sylvaticus sylvaticus.
14348. Lepus sylvaticus sylvaticus.
14348. Lepus sylvaticus sylvaticus.
Lagostomus trichodactylus.
14461. Dipodomys Philippsi.
13847. Fiber zibethicus.
14288. Fiber zibethicus.
14289. Fiber zibethicus.
14341. Castor fiber.
7017. Spermophilus Franklini.

EDENTATA.

13874. Cholœpus Hoffmanii.
8807. Cholœpus Hoffmanii.
12101. Bradypus casteneiceps.
12856. Cholœpus Hoffmanii.
11282. Mymedon dorsalis.
Solenodon cubanus. (Head.)

MARSUPIALIA.

14349. Didelphys virginiana.
14349. Didelphys virginiana.
14349. Didelphys virginiana.
14349. Didelphys virginiana.
14349. Didelphys virginiana.
11851. Didelphys californica.

SUMMARY.

Orders.	Specimens.	Species.
Primates	7	7
Cheiroptera	17	16
Insectivora	1	1
Carnivora	33	28
Pinnipedia	1	1
Ungulata	5	5
Rodentia	38	27
Edentata	6	4
Marsupialia	6	2
Total	114	91

Mounted expressly for the New Orleans Exposition, 83 specimens, 78 species.

LIST OF MAMMALS, IN THE FLESH, SECURED FOR THE UNITED STATES NATIONAL MUSEUM BY THE TAXIDERMIC DEPARTMENT DURING THE YEAR 1884.

PRIMATES.

14229. Cynocephalus porcarius.
14230. Cebus, sp.
14235. Cercocebus fuliginosus.
14247. Cercopithecus ruber.
14256. Cebus hypoleucus.
14260. Cercopithecus mona.
14261. Cynopithecus niger.
14263. Cercopithecus mona.
14290. Stenops tardigradus.
14309. Ateles ater.
14324. Cynocephalus anubis.
14338. Chlorocebus engythithea.
14339. Prosimia mongoz.
14350. Chlorocebus engythithea.
14604. Papio maimon.
14605. Cynocephalus, sp.
14664. Semnopithecus, ? sp.
14672. Cynocephalus sphinx.
14673. Cynocephalus sphinx.
14676. Macacus cynomolgus.
14688. Macacus nemestrinus.
14686. Chlorocebus cynosurus.
14687. Mormon maimon.
14704. Cercopithecus, sp.
14705 Cynocephalus anubis.
14234. Cebus, sp.

CHEIROPTERA.

14700. Pteropus Edwardsii.

CARNIVORA.

14634. Urocyon virginianus.
13966. Procyon lotor.
14699. Viverra malaccensis.
14312. Felis concolor.
14337. Felis leopardus.
14397. Felis jubata.
14398. Felis jubata.

PINNIPEDIA.

14302. Zalophus Gilliespei.

UNGULATA.

Oreas canna.
14326. Tragelaphus scripta.
44667. Dicotyles torquatus.
14706. Phacochœrus ethiopicus.
14702. Cervus porcinus.

RODENTIA.

14288. Fiber zibethicus.
14289. Fiber zibethicus.
14270. Sciuropterus volucella. (6 specimens.)
14606. Dipus hirtipes.
14346–8. Lepus sylvaticus.
14710. Lepus americanus.
14711. Lepus americanus.
14712. Lepus americanus.
14713. Lepus americanus.

MARSUPIALIA.

14841. Macropus gigas.
(Total. 56.)

MISCELLANEOUS.

2 Grus leucogeranus.
1 Cassowary.
1 Condor.
3 Cockatoos.
2 Parrots.
1 Japanese fowl (domestic).
1 Alligator 9 feet long.

MISCELLANEOUS TAXIDERMIC WORK.

Removed and preserved the skins of 57 mammals.

Repaired, repainted, and rearranged a collection of Australian fishes; 60 specimens.

Repaired 12 fur seals, and also pedestal.

Mounted 24 large mammals on new pedestals.

Reconstructed large seal group.

Renovated and repaired the collection of Ungulates, Felidæ, Ursidæ, &c.

Renovated rug for President Arthur.

Mounted 1 large halibut.

Mounted 1 shark.

Mounted 8 birds.

Mounted 4 California salmon.

Mounted 4 smaller fishes.

Mounted 2 pairs elk antlers.

Mounted 1 elk-leg trophy.

Made 5 traps.

Made 2 groups of small mammals.

Packed New Orleans exhibit of mammals, and installed the same, the taxidermic exhibit and skeleton exhibit in the New Orleans Exposition.

Mr. Henry Marshall has been engaged upon his regular work—that of mounting birds—during the whole year. A large number were prepared for the New Orleans, Louisville, and Cincinnati Expositions. In his work he has had the valuable assistance of his son, Mr. George Marshall.

(*b*) *Osteological preparator.*

Mr. Lucas has devoted his time, under the direction of the curator of mammals, to the removal of the collection of mounted skeletons from the Smithsonian building and its arrangement in the east south range of the New Museum building. The two large whale skeletons have been suspended from the ceiling, and nearly one hundred skeletons, skulls, and other osteological specimens mounted and placed on exhibition. A large number of specimens have been cleaned and rendered available for study. The necessary work of caring for the numerous fresh specimens received has precluded the possibility of devoting very much time to the exhibition series.

During the summer, while preparations for the New Orleans Exposition were being most busily carried on, an additional assistant, J. W. Scollick, was assigned to this section.

In November, on account of the low condition of the New Orleans appropriations, it was found necessary to dispense with Mr. McCormick's services. Mr. Scollick was transferred to the Museum roll.

(*c*) *Modelers.*

Mr. Joseph Palmer has been engaged in his usual work of making casts. He has prepared for exhibition and set up in the Museum the plaster casts of George Washington, Benjamin Silliman, and also the bronzed plaster cast representing an Indian group. Several casts of fishes, Indian pipes, reptiles, &c., were prepared by him for the New Orleans, Louisville, and Cincinnati Expositions. Two large casts, one of the spiny shark and one of the sperm whale porpoise, have been made with the assistance of Mr. William Palmer, who also rendered valuable service in unpacking, setting up, and repacking the collections sent to the Louisville and Cincinnati Expositions.

Mr. J. W. Hendley has made progress in the preparation of casts of animal and vegetable foods. It is intended that these casts shall be exhibited in the Department of Foods, accompanied by a statement of the chemical composition of the objects which they represent.

(*d*) *Photographer.*

Mr. T. W. Smillie reports the addition to his files of 529 negatives during the year. The following instruments have been purchased: One large vertical copying camera; one small camera; one solar microscope, including one heliostat; one camera with various illuminators, diaphragms, &c.; and a series of objectives from ½ inch to 4 inches. An electric light has also been added to the apparatus of this section, obviating the necessity of delays by reason of cloudy weather.

The apparatus in this section is extremely complete, and the photographic laboratory is now thoroughly equipped for all kinds of work. Several of the Government bureaus have recognized this fact, and have occasionally requested the permission of the Director to have certain scientific work performed here, some of which probably could not have been accomplished elsewhere. During 1884 Mr. Smillie has instructed a class of ten ensigns of the United States Navy. One of these accompanied the Greely Relief Expedition, and produced some very satisfactory results with a camera. Instruction has also been given without reserve to several scientific gentlemen who desired to acquire some knowledge of this art preparatory to their departure on various scientific expeditions.

As a special application of this art to Museum purposes may be mentioned certain work which has been performed for the Department of Building Stones. Negatives have been made of typical buildings, constructed of various kinds of stone. These have been enlarged on paper 30 by 40 inches, and colored according to the natural colors of the different kinds of stone. By means of polarized light photomicrographs were made from thin sections of stone. These were enlarged on glass and colored with transparent tints, thus presenting a picture of the section as seen with the microscope under polarized light. Specially noteworthy also were a number of photographic enlargements representing thirteen of the Government buildings in Washington. These are the largest single prints ever made, and have been found particularly effective at the New Orleans and Cincinnati Expositions, it being thought that in an exhibition of the work of the Government Departments, such as has been attempted this year by the United States Executive Board, it is particularly appropriate that the public buildings of Washington should be shown in an impressive manner.

The work accomplished in this section during 1884 is as follows:

Negatives taken	*463
Prints made	4,847
Medium size enlargements	66
Extra size enlargements (4 by 7 feet)	26
Enlargements on glass, colored	12
Enlargements on paper, colored	12
Cyanotypes	315

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* In addition to this number 66 negatives were taken in the field.

In addition to this 2,200 plates have been numbered, and filed for future use.

(e) *Artist.*

Mr. A. Zeno Shindler has been engaged in painting casts of fishes, reptiles, &c., for the Museum and for the Louisville, Cincinnati, and New Orleans Expositions. He has also made numerous sketches in oil and water-color of certain specimens on exhibition in the Museum. Four full-sized Indian busts were also painted by him for exhibition at New Orleans in connection with the ethnological department of the Museum.

(*f*) *Preparators in the Division of Anthropology.*

Mr. E. H. Hawley has been for the greater part of the year engaged in mounting collections for the New Orleans, Louisville, and Cincinnati Expositions. During the early part of the year he also arranged for exhibition the collections received from the foreign exhibition, held in Boston during the latter part of 1883. In November and December eight valuable India cashmere shawls were mounted and placed on exhibition in the Museum. An interesting collection from the Dennison Manufacturing Company, consisting of the ingredients used in the preparation of sealing wax, together with the manufactured products, is being installed by Mr. Hawley; also, a magnificent collection of ostrich feathers presented by Mr. R. T. Bénè, and imported by Joseph Andrade and Company, and some fine specimens of walrus leathers received from F. W. Gesswein.

Mr. T. M. Sweeny devoted his time during the first half of the year to the mounting of ethnological objects for display in the National Museum. As soon as the Department of Ethnology was organized, in July, he was assigned as assistant to the curator, Prof. O. T. Mason.

16. WORK IN CONNECTION WITH THE EXPOSITIONS.

(a) *The Cincinnati, Louisville, and New Orleans Expositions.*

The participation of the Smithsonian Institution, as directed by Congress, in three exhibitions, has—although in many respects detrimental to the growth of the Museum—contributed largely to the prosperity of several of its departments. In the first place, in order that material might properly be selected for exhibition, it was found necessary in many departments of the Museum to employ additional assistants in making a thorough overhauling of the material and getting it systematically arranged. In the second place, it was found necessary to purchase a considerable amount of material to fill vacancies in the various series of specimens which were shown at the exhibitions.

It has been our policy to expend the appropriation for the New Orleans Exposition in such a manner that there also might result a permanent benefit to the Museum. This we have found to be entirely consistent with the interests of the exhibitions, since the material which is useful for these temporary displays is even more useful for the permanent exhibition series of the Museum. At the same time, in many of the departments an effort has been made, in selecting specimens for the expositions, to make use of duplicate material from the Museum, in order that, should we be called upon in future to participate in other expositions, the preparation of a collection can be effected with less expense of time and money than has been heretofore practicable.

In the report for 1885 I hope to include an extended account of the New Orleans Exposition, with special reference to the specimens acquired for the National Museum by gifts and exchanges.

The following statement will, however, serve to indicate the extent of the preparations made by the Smithsonian Institution for participation in the expositions at Louisville, Cincinnati, and New Orleans:

The following preliminary report upon the exposition work of the year has been prepared by Mr. R. Edward Earll, the head of the special exposition staff:

On July 7 Congress passed a bill authorizing the representation of the various executive departments of the Government, including the Smithsonian Institution and Department of Agriculture, at the World's Industrial and Cotton Centennial Exposition to be opened in New Orleans December 1, and to continue for six months. The bill further provided for an exhibit by each of the departments at the Southern Exposition to be held at Louisville, Ky., and at the Industrial Exposition at Cincinnati, Ohio. The bill authorized the appointment by the President of representatives for each of the departments, these to constitute a United States Executive Board, to whom all questions relating to the Government participation in the various expositions were to be referred. Each representative was to be charged with the preparation of an exhibit for his department, and the funds placed to its credit by Congress were to be disbursed under his direction. Mr. G. Brown Goode, Assistant Director of the U. S. National Museum, who had represented the U. S. Fish Commission at Berlin in 1880, and at London in 1883, was appointed to represent the Smithsonian Institution, including the U. S. National Museum and U. S. Fish Commission. Seventy-five thousand dollars were placed to the credit of the Institution for the preparation of exhibits for New Orleans, with twenty-four hundred dollars additional for Louisville and twenty-three hundred dollars for Cincinnati.

THE EXHIBIT AT LOUISVILLE.

In 1883 the people of Louisville obtained control of a large plat of ground within easy access of the city and erected a building 920 feet by 630, with extensive galleries, where they held a large and successful exposition, continuing for three months. The exposition of 1884 was held under the same auspices and in the same building, opening August 16 and closing October 25.

Immediately upon the passage of the bill by Congress correspondence was opened with the management of the exposition and space obtained in different portions of the building for the several executive departments, 4,500 feet being assigned to the Smithsonian Institution, in one of the most prominent portions of the building. The time being short, the work of preparing the exhibit was vigorously prosecuted, and on August 12 three car-loads, containing 95 cases, with a weight of 23,553 pounds, were shipped. These arrived at Louisville on the morning of the 16th, and by the evening of the 19th were fully installed.

The industrial interests of Kentucky were taken into consideration in deciding upon the character of the exhibit, which it was thought desirable to make as instructive as possible. It was largely an educational exhibit, showing the processes of manufacture of raw materials which were abundant in the State, and a graphic representation of such subjects as were supposed to be least familiar to the people of Kentucky. One of the prominent features of the exhibit was a large collection showing the processes of manufacturing textiles from raw materials, including flax, hemp, jute, grasses, and silk. A collection illustrative of articles derived from the animal kingdom was also shown. This included a series of furs, another of crude and manufactured leathers, a third of natural and ornamental shells and shell-works, another illustrating the uses of feathers in the arts, and a fifth showing the manufacture and uses of glues derived from the sounds, bones, and skins of various species of fish. An extensive collection illustrative of the great ocean fisheries of the New England coast was also shown. The whale fishery was illustrated by means of a full-sized whale-boat, fully equipped with sails, oars, harpoons, lines, and guns; a model of a whale-ship with a whale alongside, showing the method of stripping the blubber, and trying it out on the vessel's deck, and by paintings of whaling scenes. The other fisheries, including those for cod, mackerel, menhaden, and herring, and the apparatus and methods of fish-culture, were fully shown by models of the most important vessels and boats, and a series of photographs 30 by 40 inches, neatly framed, classified, and mounted on screens. The natural-history collections included a representation of nearly all of the snakes and reptiles found in the United States, and a fine series of many of the water-birds of the country.

An attendant was left in charge of the exhibits during the continuance of the exposition, and at its close the exhibits were carefully packed and a majority of them forwarded directly to New Orleans, a few being returned to Washington to be remounted, with larger and more complete collections, before shipping to the New Orleans Exposition.

THE EXHIBIT AT CINCINNATI.

The Cincinnati Industrial Exposition is an institution of some years standing, and receives the cordial support of the most prominent business men of the city. Expositions have been held annually since 1873, a suitable and substantial brick building having been erected by the management. It is located in the heart of the city, and has annually a large attendance. For the season of 1884 the exposition opened on September 3, closing on the fourth of the following month.

As the space was mostly allotted before the bill authorizing Government participation in the exposition had become a law, a second building to accommodate the Government exhibits was found necessary, and the management erected a temporary structure near the main entrance, having dimensions of 50 by 200 feet. This was divided between the several departments, 3,322 square feet, or nearly one-third of the entire building, being allotted to the Smithsonian Institution. This space was situated at one end of the structure, thus admitting of a satisfactory and very pleasing installation.

As soon as the Louisville exhibits were in place the work of preparing those for Cincinnati was vigorously pushed, and the entire collection consisting of 80 cases of exhibits with a weight of 24,321 pounds was shipped on August 26, reaching the exposition at Cincinnati on September 1. A large force of men was at once set to work to unpack and arrange them, and by the opening of the exposition the arrangement was practically completed.

As at Louisville, the exhibits were largely educational, and included such objects as it was thought would be appreciated by those who saw them. One of the striking features of the exhibit was an alcove containing a collection illustrative of the social life and industries of the Eskimo and the Indians of the northwest coast; the dwellings, household utensils, and implements of war, hunting and fishing, as well as the art of the two races being shown in such a manner as to afford accurate means of comparison. A life-size bust in plaster of one of the prominent Indian chiefs with portraits in oil of thirteen others were also exhibited. Another important feature was a large and valuable collection of minerals yielding gems and ornamental stones. The natural history department contained a small but choice collection of taxidermy, including game and water birds, sparrows, and a few mammals, while a full series of Audubon colored plates of North American birds were framed and used for decoration. Two cases were devoted to a large collection of plaster casts of the more common snakes and turtles of the United States. The methods and apparatus employed in the great ocean fisheries and in fish culture were graphically represented by means of two extensive series of photographs, the largest series being solar enlargement having dimensions of 30 by 40 inches. In the fishery section was also shown a large and valuable collection of plaster casts of the important food-fishes of the country, including both fresh and salt water species. The collection of textile fabrics was very complete, including samples of many of both American and foreign fabrics, from the cheapest to the most expensive. Two alcoves, which attracted considerable attention, were devoted to photolithographs of Japanese pottery, and a large collection of photographs showing the arts of the early Saxons.

As at Louisville, the collections were placed in charge of an attendant who looked after the interests of the department during the continuance of the exposition, and at its close the exhibits were packed and the bulk of them shipped to New Orleans, to be installed with other exhibits at the exposition in that city.

THE EXHIBIT AT NEW ORLEANS.

The preparations for the exhibit at New Orleans have been very extensive. Curators from the various departments of the Museum have been charged with the collection of material to illustrate their several departments at the exposition, and assistants have been employed in arranging and mounting the collections, which, as a rule, have been provided with printed or written descriptive labels.

The building for the display of the Government and State exhibits at New Orleans is 885 feet long and 565 feet wide. A strip 185 feet wide, extending entirely across the center of the building has been assigned to the Government departments, the Smithsonian Institution occupying an area of over twenty thousand square feet at the left of the principal entrance of the building.

The exhibit includes an archæological collection of considerable size; a large and valuable ethnological collection, confined chiefly to the Indians and Eskimo of North America; a collection of models showing the development of American ship-building; a collection of American and foreign textiles, and a large and valuable collection of autotypes representing the principal artists of the world. Adjoining the last is a collection of all of the important food-fishes of the country in plaster, a collection illustrative of the recent methods of fish culture and the more important forms of fish-ladders, together with tabulated statements of the nutritive values of fish and other aquatic animals. Next comes an extensive collection of animal products, showing the various methods of utilizing the hair, fur, feathers, scales, leather, flesh, bones, intestines, and excrements of various animals. Adjoining this, and serving as a connection between it and the natural history specimens, is a collection illustrating the various devices used in the capture of animals. The natural history collection includes specimens of the principal mammals, birds, and shells, the latter being arranged according to their geographical location, the molluscan life of the Atlantic coast, the Mississippi basin, and the Pacific being shown separately. Seven cases are devoted to an extensive collection of minerals, while a large space is assigned to metallurgy and economic geology, including a collection illustrating the apparatus and methods of coal mining, and samples of the various grades of commercial coal.

The entire collection, occupying seventeen cars, was sent to New Orleans, where it is now being installed in as systematic a manner as possible, the educational idea being prominent in the arrangement.

During the progress of the several expositions many of the curators were in attendance for a short time, in order to give their personal attention to the installment of their exhibits. The Assistant Director left here on December 6, to be present at the opening of the New Orleans Exposition, and was thus enabled to superintend in person the installation of the Smithsonian exhibit so far as it was possible to complete this by the opening day. Mr. Henry Horan, superintendent of the National Museum, was detailed to attend to the three expositions at various times between August 13 and November 30, in order to assist in the arrangement of the cases. He also attended to the shipment from Cincinnati to New Orleans of the cases intended for display at the latter place.

INTERNATIONAL FISHERIES EXHIBITION OF LONDON.

The International Fisheries Exhibition of 1883 closed on October 31, and Mr. Earll, with his assistants, who were left in charge after my return, reached Washington soon after the beginning of the year, the last shipment of collections from London having already been received. The reception, unpacking, and installation of the collections which were prepared to be sent to London, together with the new material obtained from the collections of other countries at this exhibition, occupied a great deal of time in the early part of the year. As has already been mentioned, this work was completed in a preliminary manner in May, during which month the fisheries gallery was opened to the public. At the same time the gallery devoted to naval architecture—a department which also received great impetus in connection with the London Exhibition—was also thrown open. The fisheries collection will undoubtedly for some years stand as the first completed and most thoroughly arranged collection in the department of arts and industries. During the year a full catalogue of the collection, as shown in London, has been printed, which, although far from corresponding to the standard proposed for the Museum hand-books, will serve as a starting point for this series. This catalogue may be considered as a report upon the participation by the United States in the London Fisheries Exhibition. The report upon the general exhibition is now, as the law requires, in course of preparation, and will be presented to the Secretary of State during the coming year.

E.—REVIEW OF THE YEAR'S WORK IN THE SCIENTIFIC DEPARTMENTS.

As in my last report, I here present a brief review of what has been accomplished in each department of the several scientific divisions. The curators' reports are given in full in Part II of this report. These are especially intended to embrace (1) a review of the important additions during the year; (2) a statement of the character of routine work employed in arranging and classifying the collections, and in preparing the exhibition and study series.

17. DIVISION OF ANTHROPOLOGY.

(a) *Department of Arts and Industries.*

The curator of this department is the custodian of all materials possessing anthropological significance, which are not elsewhere assigned. Its belongings are consequently somewhat heterogeneous and difficult to report upon, and its relations with the Department of Ethnology are so intimate that it is impossible to make a definite division between them. Certain collections belonging to this department are under the charge of other curators, the collection of building-stones being assigned to the department of lithology and physical geology, while all that relates to mining and metal-working is cared for by the curator of metallurgy and economic geology. Several sub-curatorships have grown up in this department, and certain other collections, especially those of architecture, musical instruments, and modern ceramics, together with the somewhat anomalous collection of historical objects, are at present assigned to this curatorship.

When, in 1857, the Smithsonian Institution assumed the custody of the collection of the United States Exploring Expedition, together with the miscellaneous material which had gathered around this nucleus, a great quantity of material was transferred to the Smithsonian building which has not to this day been classified and placed upon exhibition. The rapid growth, especially during the past decade, of the collections illustrating the ethnology of North American Indians, and especially of prehistoric objects from this continent, has absorbed the attention of all who were interested in this department of the Museum. The majority of the foreign ethnological objects are still, on account of lack of room, packed up or crowded together in a too limited amount of case-room. At the close of the Centennial Exhibition the Museum received from foreign Governments great quantities of material exhibited at Philadelphia, which, while possessing an undoubted ethnological interest, could not in many instances be displayed in the manner usually adopted in ethnological museums.

The material received from Philadelphia in 1876 was for several years stored in the Armory building. On completion of the present Museum building, and before the collections could be transferred to it, it became necessary to decide by what method the stored material (other than zoological, botanical, geological, or mineralogical) could be most effectively classified for purposes of study and exhibition.

After a careful consideration of the methods of the large museums of Europe, the officers of the Museum agreed that the ordinary classification by races or tribes would in this case be less satisfactory than a classification based upon function.

The Report of the Smithsonian Institution for 1881, pages 117–122, and also Circular No. 13, of the National Museum, presented a provisional outline of the plan of classification for the Museum. This classification, while its purpose was to embrace every kind of object which could possibly be exhibited in the Museum, was especially full in those parts which related to the arts and industries, forty-nine out of the sixty-four primary classes relating to this group of museum material. The general idea of the classification, as there explained, is that the collections should constitute a museum of anthropology, the word "anthropology" being applied in its most comprehensive sense. It should exhibit the physical characteristics, the history, the manners past and present of all races civilized and savage, and should also illustrate human culture and industry in all their phases; the earth, its physical structure, and its products are to be exhibited with special reference to their adaptation for use by man.

Some experiments have already been made with reference to the feasibility of this plan of arranging the exhibition series, but I am not yet prepared to recommend its final acceptance; indeed the experience of three years has brought about many changes in the plan, and a revision is now being made by Professor Mason and myself.

The adoption of any plan of this general character would necessitate the grouping together, in continuous series, of objects which had never before been placed side by side in any museum. If the evolution of any given industry or class of objects is to be shown, the series should begin with the simplest types and close with the most perfect and elaborate objects of the same class which human effort has produced.

In the textile industry, for instance, at one extreme is shown the simple whorl of stone or terra cotta, used by savage or semi-civilized man, together with the archaic representative of the same, surviving among rural members of the most highly civilized races; these being supplemented by the threads and the simple woven fabrics produced by them; on the other hand, the steam spinning apparatus and the power and Jacquard looms.

Much attention has been devoted during the year to experiments for determining the manner in which the idea of this classification can best be carried into effect. It is not possible within the limits of this report to describe what has been done. In fact a full account of them at present would be premature. The practicability of the scheme can best be judged upon by an examination of the one or two groups, such as the materia medica collection, the collection of musical instruments, and the portion of the costume collection, which are already partly installed.

The Department of Arts and Industries is not yet established upon the same footing as the others in the Museum, nor is it yet quite certain what form it will assume in the future. I shall therefore not undertake to present a formal report upon its operations, but shall submit in the appendix the reports of the curators of materia medica, textile industries, foods and naval architecture, and refer back to my report of 1883 for a statement of the character of the work which was in progress at the end of that year, and which has been continued during the present year, so far as the interruptions connected with exposition work have permitted.

The installation of the section of fisheries,* under the immediate direction of Mr. R. E. Earll, was actively carried on from January to May, and on the evening of May 14, at 7.30 p. m., the fisheries section of the National Museum was formally opened to the public. This occasion was one of special interest, from the fact that the collections in this section were the same that had been exhibited at the International Fisheries Exhibition at London in 1883, together with certain collections which had been acquired in London by gift and exchange. The building was illuminated by electric lights, fitted up for the occasion by the Brush-Swan Electric Light Company. The Director of the Museum held an informal reception in the north main hall. The number of visitors on this occasion was 2,033.

This section presents no special report, except in the form of the catalogue of the American section at the London Fisheries Exhibition, which is in fact an elaborate report upon everything in the section, and which is referred to elsewhere. At the New Orleans Exposition the Department of Fisheries was represented by about sixty of the large pictures prepared for the London Exhibition, and by about 200 casts of American food-fishes, which also had direct relation to the animal products collection just referred to. It was not deemed expedient to dismantle the general fishery collections so recently installed, for such a temporary interest as that of these exhibitions. The United States Fish Commission made preparations for a considerable display of fish-culture, and a representative collection of fish-cultural apparatus was sent from the Museum.

Mr. Hitchcock, the curator of the textile collection, has been principally occupied in exposition work, in connection with which he undertook the preparation of a collection of textile fibers and fabrics. Portions of this collection were exhibited both at Louisville and Cincinnati.

Captain Collins, on behalf of the Department of Naval Architecture, prepared a series of working models illustrating the development of the ship-building industry in the United States, and especially the evolution of the American schooner, the American pilot-boat, and the American cotton-ship. A number of full-rigged models were also sent in this connection, being exhibited on the way at Louisville and Cincinnati. The model of a whale-boat, fully equipped with all appliances for the capture of whales, was also sent. This model attracted much attention at the London and Berlin Fisheries Exhibitions.

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* Report U. S. N. M., 1883, pp. 16, 17.

The animal products collection, which was so prominent a feature in the exhibition of this Institution at Philadelphia, has been reorganized and greatly extended, so that it now represents very thoroughly the applications of animals to the uses of mankind in all parts of the world. This collection alone, if arranged in table-cases, would occupy a floor-space equivalent to that in one of the large halls of the new Museum building. The Museum has received many important gifts for this collection on condition that they be exhibited in New Orleans before being finally placed in the Museum.

A selection of about 250 of the celebrated autotypes published by Adolph Braun & Co., of Dornach, have been acquired for use at the exhibitions. This collection illustrates the history of painting from the time of Cimabue and Giotto, including copies of from one to six of the best representative works of each celebrated master so far as it was practicable to obtain them. This collection can be packed in a very small space, and is particularly well suited for sending away to exhibitions. It may in future be somewhat extended to good advantage.

(*b*) *Department of Ethnology.*

Prof. Otis T. Mason, for many years connected with the Columbian University, of this city, was appointed curator of this department upon the 1st of July. The Museum may well be congratulated upon the addition of this skillful ethnologist to its staff. Professor Mason, as is well known, was one of the first in America to embrace in his studies the entire subject of the natural history of man, or what is known now as the science of anthropology. His publications upon this subject, beginning with his paper upon the Leipsic Museum, published in the Smithsonian Annual Report for 1873; his articles upon ethnology in Harper's Record of Science and Industry from 1873 to 1877; the Smithsonian Record of Progress from 1878 to 1884; the directions for collectors for the Centennial Exposition, issued by the Indian Bureau in 1875; his lectures in the Saturday course, delivered in the Museum; also his papers presented to the American Association, and his contributions to the American Naturalist, extending over a period of twenty years, are all devoted to the comprehensive study of man.

He was the associate of the late Mr. Louis H. Morgan in organizing the anthropological section of the American Association in 1876, and was one of the founders of the Anthropological Society of Washington in 1879, writing its constitution.

A prominent characteristic of his work has been the introduction of regular scientific methods into anthropological inquiries, treating each savage art as the anatomist or embryologist treats his subject.

The energy of Professor Mason has already produced important results in that the ethnological collections, never before under control, have already been provisionally classified. In the present report are presented three papers emanating from this department—on the basketry, throwing-sticks, and bows in the National Museum—and it is much to be hoped that the method of investigation and publication foreshadowed in these papers will be prosecuted until the discussion of the whole round of savage art as exemplified in our collections shall have been completed.

During the year 3,658 specimens belonging to primitive races have been received. In addition to these this department has been intrusted with many objects registered in other catalogues and deposited here for the sake of completing evolutionary series of implements, processes, and art products. The most noteworthy accessions in 1884 were as follows:

Illustrations of Eskimo and Indian life, from Ungava Bay and vicinity, by Lucien Turner, who will prepare a monograph upon the specimens.

Illustrations of Eskimo life at Point Barrow, collected by Lieutenant Ray, U. S. A. Mr. John Murdoch will describe these.

Rich collections from the Eskimo of Western and Southern Alaska, by E. W. Nelson, W. J. Fisher, Charles L. McKay, and Baron Nordenskjöld.

Specimens of the arts of the tribes of Northwest America, collected by James G. Swan and Lieut. T. Dix Bolles.

Many objects illustrative of the modern Indians of Yucatan, by Louis H. Aymé.

A very large and instructive collection of objects from the Peruvian huacas, by George W. Keifer, and Dr. William H. Jones, U. S. N.

A collection of weapons &c., from New Guinea, purchased from A. P. Goodwin.

An exchange series of weapons from Polynesia, contributed by Charles Heape.

During the year illustrative series of ethnological objects have been exhibited at Cincinnati, Louisville, and New Orleans, care being taken in each case to impress some ethnological truth, such as distribution of types, the effect of environment, the treatment of the same art by different tribes, or the progress of an art from its infancy to its highest manifestation. This special collection was displayed in 120 unit boxes, 17 double unit boxes, 37 costume boxes, and 2 slope tables. In addition, 1 model of an Eskimo house, 1 model of a Haida house, and 2 Indian busts were sent.

(c.) *Department of American Prehistoric Pottery.*

Mr. William H. Holmes, having been assigned by the director of the Bureau of Ethnology of the Smithsonian Institution to the work of preparing a report upon American aboriginal pottery, has been appointed honorary curator of this section of the Museum. He has been engaged during the year in classifying the entire collection and in preparing the exhibition series. The northwest court, which has been assigned to this section, will be opened to the public as soon as cases can be provided and the specimens installed. More than 10,000 specimens have been added to this department during the year. By far the most prominent among the contributors is the Bureau of Ethnology, which has added 6,000 pieces of pottery to this department. A magnificent accession of 3,000 vases from the tombs of Chiriqui was bought from Mr. J. C. McNeil, and a very valuable collection from Peru has been received through the agency of Dr. William H. Jones, U. S. N.

(d) *Department of Antiquities.*

The Department of Prehistoric Antiquities, under the charge of Dr. Charles Rau, has kept pace with all the others in growth and general progress. The present somewhat unsettled condition of the upper main hall of the Smithsonian building, in which these collections are exhibited, is due to the fact that the arts and industries collections, formerly placed here, have not been entirely removed, owing to the lack of exhibition cases in the new building. The arrangement of the gallery of antiquities is, however, as far advanced as any in the Museum. To as great an extent as opportunity and case-room have permitted, Dr. Rau has carried out his double system of arrangement, placing in one extensive series, which is for the most part exhibited in flat cases, collections grouped according to material and form, enabling visitors to take in at a glance "the whole culture of prehistoric North America, in so far as can be represented by tangible tokens." In another series are placed special collections, including the articles found in given single localities, whether mounds, graves, or shell-deposit districts. It is in the arrangement of these special collections that the most noticeable changes have been made.

Here, as elsewhere, the preparations for the New Orleans Exposition have seriously interfered with the general work. An extensive educational series of stone implements, illustrating American archæology, has, however, been prepared, and casts have been made of every characteristic form of stone implement. The collection, when complete, will constitute, in fact, a set of illustrations in actuality of the text of Dr. Rau's paper entitled "The Archæological Collection of the United States National Museum,"* and the work, which has been done well, will be of service not only for future exhibitions, but in the preparation of typical collections to be distributed to educational institutions.

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* Published by the Smithsonian Institution, 1876, as No. 287, Smithsonian Contributions to Knowledge.

The number of accessions during the year amounted to 5,441, and the total number of specimens in the collection is 45,252, of which 8,522 are duplicates. The principal literary product of the department has been a work upon prehistoric fishing in Europe and North America, prepared by the curator.

18. DIVISION OF ZOOLOGY.

(*a*) *Department of Mammals.*

Notwithstanding the absence of the curator, Mr. Frederick W. True, in Europe during the first quarter of the year, and other diversions of his attention and time to routine work not connected with his regular duties, the progress of this department has been exceedingly satisfactory. The work upon the exhibition series has been hampered by the fact that money has not been available for the construction of the desired cases in the mammal hall. The collection is now, for the first time in many years, thoroughly classified and under control, and the total number of skins and alcoholic specimens is reported to be 5,604, of skulls and skeletons 4,212, making a total of 9,908.

The accessions of the year have, in number, variety, and importance, been fully equal to those of earlier periods. No less than 38 specimens, including such rare and peculiar forms as the eland, harnessed antelope, cheetah, two species of lemur, wart-hog, and baboons, have been received from the proprietors of zoological gardens and menageries, for which due acknowledgments are given in the Museum report. An unusual number of cetaceans and seals, many of great novelty and interest, have been received from various sources. The amount of taxidermic work accomplished has been unusually great, owing to a special allotment for the employment of extra help, made from the appropriation for the New Orleans Exhibition, 149 specimens in all having been added to the mounted series, including several large forms such as the buffalo, puma, jaguar, and beaver.

(*b*) *Department of Birds.*

This year is shown by the report of Mr. Ridgway to have been one of unusual activity in the Department of Birds. The collections have been entirely rearranged, and the exhibition series is receiving a complete overhauling. Over 1,200 skins have been mounted, and several hundred of them fastened on walnut stands. Copy for 1,000 labels has been prepared. The total number of specimens in the reserve series is 50,350, 6,800 of which are in the exhibition series. In this, as in several other departments, the main direction of effort during the year was towards the preparation of the special exhibit of North American game-birds for the New Orleans Exposition, comprising 171 specimens, representing 123 species. Considerable time was also spent in unpacking and installing the exhibits which had been sent to the International Fisheries Exhibition, London, in 1883.

Mr. Ridgway reports that the year has been unprecedented in the extent of the accessions. The number of birds added during the year is 8,142, 2,658 skins having been distributed. Of this number 94 specimens were collected during the cruise of the United States Fish Commission steamer Albatross among the West India Islands; 675 specimens, mainly from Japan, and presented by Capt. T. W. Blackiston; 473 specimens from the British Museum; 768 specimens from Alaska and 21 specimens from Arizona, collected by E. W. Nelson; 256 specimens, chiefly from India, received from Mr. R. Bowdler Sharpe, of the British Museum; 84 specimens presented by Dr. Leonhard Stejneger; 478 specimens from Northern California, and 55 specimens from the Farallone Islands, collected by Mr. Charles H. Townsend; and 1,705 specimens from Ungava, Labrador, collected by Mr. Lucien M. Turner. Many other large and valuable accessions were also made, as will be seen by referring to the list of accessions in the report of the curator. Nearly 3,000 specimens were sent out in exchange or loaned for examination.

Birds' eggs.

The collection of birds' eggs has been overhauled and rearranged by Capt. Charles E. Bendire, U. S. A., the honorary curator of this department, who has also presented to the Museum his magnificent collection of about 8,000 eggs. The grand total of specimens in this section is 40,072, of which 35,800 are North American. This collection now represents nearly all that is known of American oology, and contains 40,072 specimens, of which 4,272 are foreign.

A large collection of 468 specimens was received from Dr. James C. Merrill, U. S. A. Other important accessions were made by Mr. E. W. Nelson, Lieut. P. H. Ray, U. S. A., Dr. Leonhard Stejneger, Mr. Charles H. Townsend, Governor Fencher, of Godthaab, Greenland, and others.

Forty-five specimens were exchanged or loaned for examination.

(c) *Department of Reptiles and Batrachians.*

Extensive and valuable additions have been made to the collections of this department during the year. Dr. H. C. Yarrow has continued to serve as curator in the capacity of volunteer. It has not yet been found practicable to assign any space in the Museum for the exhibition of these collections, and owing to the already crowded condition of the new Museum building it is feared that no exhibition space can be assigned to this department until the Museum shall have been enabled to extend its walls. During the summer the curator visited Utah for the purpose of scientific study, and while there collected many interesting specimens of reptiles, which were added to the Museum collections. The principal accessions to this department in 1884 were made by Capt. Charles Bendire, U. S. A., Mr. Charles H. Townsend, Mr. C. J. Hering, and by the scientific staff which accompanied the United States Fish Commission steamer Albatross on her cruise to the West Indies.

(d) *Department of Fishes.*

The work upon this extensive and unwieldly collection has made fine progress during the year. The curator, Dr. Bean, has nearly completed his card catalogue of the reserve series, and during the summer Prof. D. S. Jordan was employed, in the interest of the New Orleans Exhibition, in selecting out a special exhibition series to include all the fresh-water fishes of the United States, and to make a special collecting trip through the Mississippi Valley, with the view to supply such species as were lacking in the collection. This trip has been of great importance to the science of ichthyology, bringing to light very many important facts concerning the fishes of a region not previously explored ichthyologically, and throwing much light upon the whole subject of distribution. Out of the 560 fresh-water species known to inhabit North America, the Museum now has all but 49, 30 having been added by this trip, and some 25 new species having been brought to light.

Of the 93 accessions to this department during the year 34 are regarded as of great value. A large collection was received from Mr. L. M. Turner. The U. S. Fish Commission contributed fifteen bottles of deep-sea forms, including at least 20 new fishes from the deep-sea fauna. These were of great value. Prof. D. S. Jordan sent a collection of Venetian fishes containing 23 species; a large collection of fishes from Cuba and Florida, containing many new species; a collection of fresh-water fishes from Southern Missouri, Kansas, Arkansas, Indian Territory, Indiana, &c. The curator added to the collection of this department 63 species of marine and fresh-water fishes from Great South Bay, Long Island, and vicinity.

The total number of entries in the catalogue during the year was 3,015.

During the year 127 drawings of fishes were added to the portfolio, 117 of which were made by Mr. H. L. Todd, and 10 by Miss. M. M. Smith, whose ability for this work is very decided.

Forty-one papers based upon material belonging to the department were published by signatures in the Proceedings of the National Museum for 1884.

The number of specimens in the collections is estimated at about 68,000, of which 36,000 are in the reserve series, 21,000 on exhibition, and some 12,000 duplicates.

A laborious and slow operation has been the transfer of the specimens from the old tanks into new ones and into glass jars.

(e) *Department of Comparative Anatomy.*

A Department of Comparative Anatomy is being organized, under the charge of Mr. Frederick W. True, and the east-south range has been fitted up with a set of cases especially constructed after new designs for the reception of the preparations. Mr. Lucas, with his two assistants, has been engaged during the latter part of the year in mounting skeletons, and fully 150 fine preparations have been put on exhibition. The report of Mr. True upon the plan of organization will not be presented until next year, since much preparatory work remains to be done. A case illustrating the work in this department was sent to the New Orleans Exposition.

(*f*) *Department of Mollusks.*

Mr. W. H. Dall, who has for many years had charge of the collection of mollusks, having been appointed one of the paleontologists of the Geological Survey, and assigned to the Department of Quaternary Mollusks, has, by the request of the Director of the Survey, been assigned working-rooms in the Smithsonian building, and will continue to care for the department as heretofore, access to the collections of recent shells being necessary for comparison with the shells of the Quaternary beds, which are, for the most part, specifically identical. Prof. R. E. C. Stearns, late of the University of California, has been assigned to this department as adjunct curator, and since the 1st of July there has been great activity in rearranging the collections. It was decided to make an extensive display of the mollusks of the United States at the New Orleans Exposition, and the well-known Stearns collection of mollusks, for which negotiations had been in progress for some years, was purchased from the exhibition appropriation. Professor Stearns had in charge the preparation of the series for New Orleans, which occupied his time from July until the end of the year. This occupied twenty large cases, and exhibits the economic mollusks of both coasts and the adjacent seas, and the fresh-water mussels which form so remarkable a part of the fauna of the great Mississippi basin. Mr. R. Ellsworth Call has been employed for six months in connection with the New Orleans work, and by the efforts of these three conchologists, with the help of two clerks, much progress has been made toward getting under final control the immense mass of material in this department.

The identification of the specimens representing the American land shells has occupied the attention of the curator. He has also devoted himself to the study of the deep-sea forms obtained from the Gulf of Mexico and the Caribbean Sea by Prof. Alexander Agassiz.

It is Mr. Dall's opinion that, when the mass of material which yet remains to be examined has been classified, the national collections, as far as the fauna of North America and its adjacent seas is concerned, will not be surpassed by any other collection in the world.

The most important accessions to this department in 1884 were presented by Henry Hemphill, the United States Signal Office, Dr. Leonhard Stejneger, Rev. E. Lehnert, Dr. William H. Jones, U. S. N., and R. Ellsworth Call.

(*g*) *Department of Insects.*

Prof. C. V. Riley has, as in previous years, voluntarily assumed the care of the entomological material which has come in, and his own valuable and constantly-increasing collection remains a deposit in the Museum., A collection of insects injurious to forest trees, mounted in Museum cases, in the style which it is proposed by Professor Riley to adopt in the arrangement of our exhibition series when the opportunity comes, was sent to the International Forestry Exhibition in Edinburgh and received a gold medal. Fifty-five accession lots were received during the year, the most valuable being the collection made by L. M. Turner, at Ungava Bay, H. B. T.

There were 55 accessions to this department during the year, of which the collections made by Mr. Lucien M. Turner is perhaps the most valuable.

The curator was called upon by the Department of Agriculture to prepare an exhibit for the New Orleans Exposition, and it was agreed that upon the return of this exhibit to Washington it should be incorporated with the Museum collections. It is hoped that the financial condition of the Museum will soon warrant the placing of this very important and long-neglected department upon a footing of equality with the others.

(*h*) *Department of Marine Invertebrates.**

In the Department of Marine Invertebrates, exclusive of the mollusca, under the charge of Mr. Rathbun, 240 cases or specimens, enumerated in 72 accessions, have been added during the year. Of these, the most important have been received from the United States Fish Commission, from Dr. Edward Palmer, a collector employed in the interest of the New Orleans Exhibition, and from various naval sources. The Fish Commission collections are mainly illustrative of the recent deep-sea explorations of the steamer Albatross, off the eastern coast of the United States, and in the Gulf of Mexico and Caribbean Sea, and contain many new additions to science, which have been worked up only in part. They fill several thousand jars and vials. The collection of Dr. Palmer was made for the purpose of representing, at the World's Fair in New Orleans, the varied animal resources of the coral reef and sponge regions of southern and western Florida. It consists for the most part of finely prepared specimens of commercial and other sponges, ornamental corals, and the larger species of crustaceans and mollusks used as food, and required 65 large shipping cases to transport it to Washington. Supplemental to this is an extensive collection made by Mr. Henry Hemphill on the western coast of Florida.

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* Exclusive of the mollusca.

Among the more interesting of the naval contributions are several collections of crustaceans and echinoderms obtained by Dr. W. H. Jones, U. S. N., in different parts of the Pacific Ocean. A number of valuable collections, carefully identified, have also been received from competent European authorities, and will be of great service in the elaboration of new materials contained in the Museum.

The increase of accessions to this department has been so great during the year, especially by reason of the material furnished by the Fish Commission, that, even with the aid of three or four assistants, little more could be done than to take care of the new material.

(*i*) *Department of Invertebrate Fossils* (*Paleozoic Section*).

The collections of this department are arranged in 13 unit table cases, and in office trays equivalent in capacity to as many more. Mr. Walcott estimates the total number of specimens at 25,000, including the old Smithsonian collections, and the accessions from the recent Government surveys and other sources up to the present time. The most important accession of the year is that of Devonian and Carboniferous fossils from the United States Geological Survey, many of them types of new species, and forming the basis of Mr. Walcott's recent report upon "The Paleontology of the Eureka District, Nevada."

Mr. Walcott has devoted his time chiefly to the identification and labeling of the accessions, and has, as far as possible, advanced the work of arranging the old collections of the Smithsonian Institution. Inasmuch as the curator holds the position of paleozoic paleontologist of the United States Geological Survey, it is impossible that progress in the work upon the Museum collections can be as rapid as would be the case were it practicable for Mr. Walcott to devote his entire time to these. It must, however, be remembered that these result, from his work in connection with the Geological Survey, in many important additions to the Museum collections.

A comparison between the unassorted condition of the collections under Mr. Walcott's care in the winter of 1883 with their present state of classification and arrangement makes evident the fact that this department is among the most highly developed in the Museum.

(*k*) *Department of Invertebrate Fossils* (*Meso-Cenozoic Section*).

The accessions of the year in this department consist of 85 boxes from the Geological Survey, embracing collections made in California, Oregon, New Jersey, Florida, Alabama, and Mississippi, and 15 miscellaneous lots sent from private sources to the Museum. The catalogue numbers 1,158 entries. From Dr. White, the curator of this department, as from many others, there comes a request for more room; these requests we are striving to grant as rapidly as the appropriation for the construction of cases will allow, but it is doubtful if the necessities of the case can be fully met until a new building can be put up.

Dr. White is preparing a complete index of all the mesozoic and cenozoic invertebrate fossils of North America. A catalogue of all the type-specimens of the mesozoic and cenozoic species belonging to the Museum, is nearly completed.

19. DIVISION OF BOTANY.

(*a*) *Department of Plants, Fossil and Recent.*

The collection of fossil plants now contains 923 distinct species identified and installed. The report of Prof. Lester F. Ward contains elaborate statistics of the collection, from which it appears that 7,291 specimens have already been catalogued. The accessions of the year have been of but slight importance. The Joad collection of recent plants has not yet been unpacked, owing to lack of room, but will soon be arranged and in proper condition for study. During the year Mr. William R. Smith, superintendent of the Government botanic gardens, has placed in the rotunda of the new building a number of very beautiful palms, which add very much to the attractiveness of the apartment, and which, having been selected with reference to their economic importance to man, will, when labeled, furnish instruction as well as pleasure to the visitors.

Through the assistance of Mr. Frank H. Knowlton, the curator has been enabled to classify and catalogue a large mass of unassorted material which has accumulated in this department.

20. DIVISION OF GEOLOGY.

(*a*) *Department of Mineralogy.*

Considerable progress has been achieved in the development of this department. The curator has performed valuable work in instituting scientific investigation upon specimens, the results of which have been valuable to the Museum.

During the year the growth of the collections has been steady and encouraging, the work of installing the collections has been definitely begun, and a system of exchanges has been fairly inaugurated. The reserve series contains 5,881 specimens, and the duplicate series, 5,883.

The accessions have been large and numerous. The most important is that of Mr. Joseph Willcox, Media, Pa. This collection consists of about 1,400 specimens, and is in some respects one of the finest in America. The collection of Col. J. J. Abert, presented by his son, J. T. Abert, and consisting of 1,245 specimens, is also of great value and interest.

An allotment of $2,500 from the New Orleans appropriation was devoted to building up the collection of gems and ornamental stones. The schedule adopted included all the gems proper, rock crystal, agates and jaspers, malachite, lapis-lazuli, &c., and every important gem or ornamental species was secured both in the rough and cut conditions.

About 1,000 specimens are on exhibition at New Orleans, of which nearly one-third are cut and polished stones. A part of this collection was exhibited at Cincinnati, where it was awarded a silver medal. In connection with the New Orleans work, two important collecting trips were made by Mr. Yeates to northern New York, and the Hot Springs of Arkansas. The total number of specimens in the collection is estimated at 15,288. The curator, while in the field in connection with the United States Geological Survey, did excellent work for the Museum. Many good things were also obtained through exchange.

(b) *Department of Lithology and Physical Geology.*

The accessions to this department, which is under the curatorship of Mr. George P. Merrill, have been very numerous. The total number of entries amounts to 2,541, including not less than 300 specimens administered upon during the year. Important contributions have been received from 107 sources, besides many others of minor value. The most prominent donations to the department were a series of rocks and tufas from Utah, Nevada, and California, collected by Mr. I. C. Russell and transferred by the Geological Survey, and a large collection of building-stones from Mr. John S. F. Batchen; Messrs. Wharton, Houghton, Bartlett, and Marshall, Messrs. Abbott and Stearns, Lieut. G. N. Stoney, Mr. J. S. Diller, Dr. T. M. Chatard, the Esperanza Marble Company, Mr. L. J. Griffin, Mr. A. C. Proctor, Bowker, Torrey & Company, Messrs. Dimond & Hall, and Prof. Thomas Robinson, also made valuable contributions. Mr. Merrill prepared a large and important series of specimens of the building and ornamental stones of the United States for the New Orleans Exposition, comprising 358 specimens, an educational series of rocks, containing 500 specimens, and a collection of rock-forming minerals. In this work he had the efficient assistance of Mr. L. H. Merrill, and the services of a number of stone-cutters for some months. In addition to this work, 1,557 descriptive labels were printed and 200 thin sections of rocks prepared.

The exhibition series of the lithological collections comprises about 800 specimens, and this number can easily be doubled as soon as cases are provided. Some of the beautiful colored photographic enlargements on glass, illustrating the structure of twelve selected types of rocks, were among the most striking products of the year's work in Mr. Merrill's laboratory and are of very great educational value. As a supplement to the building-stone collection, a set of photographic negatives of some of the more important stone buildings in the country has been made, and from them enlarged prints (30 by 40 inches) have been prepared and colored, showing the appearance of various kinds of building stones used in architectural work.

The most important collections in the Department of Physical Geology are: the collection of lavas from Ice Springs Butte, Utah; two specimens of glacial polished mica from Prof. F. W. Clarke, and one large block of glacial polished marble, a gift of the Gouverneur Marble Company.

The total number of specimens in the reserve series is estimated at 15,000, of which some 3,000 are on exhibition. Of these 4,246 are building or ornamental stones, 1,658 of which are on exhibition. The number of specimens in the duplicate series is about 3,000.

(c) *Department of Metallurgy and Economic Geology.*

An immense amount of work has been performed in this department during the year. The curator, Mr. Fred. P. Dewey, divides the material administered upon and collected during the year into four classes: (1) those received as accessions in the usual way; (2) those received from the permanent exhibition in Philadelphia; (3) those received from the Boston Exhibition, and (4) the material specially collected for display at the New Orleans Exposition. The collections embraced under the last head were very numerous and valuable. A series of 87 specimens, representing the occurrence of placer gold at most of the prominent regions, was purchased, and is the most full and complete collection of its kind in the country. The early part of the year was devoted to administration upon great quantities of material which had been accumulating for many years, and was stored away in the southwest court. From this source alone 7,540 new specimens were added to the collections of the department. Not less than 9,500 specimens have been placed on exhibition, and the total number of specimens in the department is estimated at 40,000.

Since July, Mr. Dewey and his staff have been preparing the New Orleans collection, having an allotment of $5,000 wherewith to illustrate the metallic resources of the country, and by the aid of a number of volunteer assistants in the field the collection has received accessions of very great value, which make it one of the most valuable metallurgical collections in the world.

The organization of the collections in economic geology has consumed a great deal of time. The curator reports that in the development of this branch of the department a serious obstacle is presented by the unwillingness on the part of mine owners to impart such information as is necessary in order that the specimens shall attain their highest value in an educational series.

Mr. Thomas Donaldson has continued the work of cataloguing and packing the collection of the American Institute of Mining Engineers, which, having been presented to the Museum, are still in Philadelphia under his charge.

21. MISCELLANEOUS DEPARTMENTS.

(a) *Exploration and field work.*

As in previous years the work of exploration and investigations in the field has been under the immediate auspices of the Smithsonian Institution, and under the special care and direction of the Secretary, who has published a full account in his report to the Regents of the Institution, pages 13–28.

An abstract of this report, giving special references to the additions made to the collections through the efforts of explorers, is here presented.

Greenland.—Considering that the whole energy of the Greely Relief Expedition had to be devoted to the rescue of the Lady Franklin Bay party, the natural history collections are richer than might have been expected; the numerous photographs of the country, of the natives, and the ice, in its various shapes and formations, will be of lasting value.

The physical observations during the course of the expedition were made part of the regular routine of the vessels. The natural history work was prosecuted by naval ensigns who had been sent by the Navy Department to the Smithsonian Institution specially for the purpose of being trained for such duty. Among these were Messrs. C. A. Harlow, A. A. Ackerman, and C. S. McClain. These gentlemen had all been trained at the Institution in the methods of instantaneous photography, in taxidermy, and in the collecting of minerals and fossils; and although the time occupied by the expedition was very much less than had been anticipated, very interesting and desirable collections of rock specimens, minerals, fossils, numerous birds, and of fishes and marine invertebrates in alcohol, were made by the gentlemen mentioned.

The Greely Relief Expedition fully and entirely carried out its mission of restoring the survivors of the Greely party to their friends in the United States. By far the greater part, however, of the apparatus and collections made in the several years of absence was left behind at Fort Conger, and may never be recovered. A few specimens were brought home by Lieutenant Greely, but have not been received at the National Museum.

Labrador.—The reports of 1882 and 1883 give full details of the work prosecuted by Mr. L. M. Turner at Fort Chimo, Ungava Bay, in Northern Labrador. Mr. Turner's two years of detail expiring in 1884, he returned to Washington and is now engaged in preparing his report. His collections are described by him as consisting:

"Of birds, 1,800 specimens; eggs, 1,800 specimens; fishes, 1,000 specimens; mammals, 200 specimens; ethnological, 600 articles; plants, a great number; insects, over 200,000; geological specimens, a great variety; Eskimo linguistics, over 500 pages of manuscript, embracing thousands of words and over 800 sentences, which were obtained during the winter nights and at other times when outdoor work could not be done."

Reference was made in a preceding report to the work accomplished by Dr. C. Hart Merriam in the investigation of the natural history of the seals of the coast of Labrador; the arrangements made by him in Newfoundland and Labrador have furnished additional material in the way of skins and skeletons of several species of seals, the results of which he has shared with the National Museum.

Arctic coast.—Captain Healy and officers of the revenue steamer Corwin have supplied collections of minerals, birds, fish, invertebrates, &c., from Hotham Inlet and other points along the coast.

Lieut. George M. Stoney, U. S. N., of the schooner Ounalaska, who had visited Arctic America and explored Hotham Inlet and the rivers entering into it, obtained an interesting series of rocks from the volcano in Behring's Sea. The collections made by him have not, however, yet come to hand.

Both Captain Healy and Lieutenant Stoney have furnished specimens of some minerals which were supposed to be jade, but which proved to be serpentine and green quartzite.

The Pacific Steam Whaling Company established during the year a depot at Cape Lisburne, with Mr. D. Woolfe in command, for the purpose of mining coal for the use of the whalers, and specimens of this coal and of the associated fossils have been furnished.

The North Pacific.—Reference was made in a previous report to the very important work accomplished by Dr. L. Stejneger in Kamtschatka and the adjacent group of the Commander Islands. Through the courtesy of Governor Grebnitski, in command of these islands, a number of additional collections were received.

Dr. Stejneger also received from Captain Hunter some skins and skeletons of the mountain sheep of Kamtschatka.

Alaska.—The Signal Service station at Nushagak, on Bristol Bay, has been re-established by Mr. J. W. Johnson, from whom a collection of birds was lately received, which was specially noteworthy as containing specimens of the Alaska willow wren and of the yellow wagtail, representing a locality many hundreds of miles further south than Saint Michael's, the place of previous record.

Mr. John J. McLean, of the Signal Service, stationed at Sitka, has secured many ethnological objects of great rarity.

Mr. W. J. Fischer, who is stationed by the Coast Survey at Kodiak, has used many opportunities both there and in the adjacent regions to continue his important work; this including much information in regard to the manners and characteristics of the native tribes.

From the Rev. J. Loomis Gould a collection of Indian carvings and other articles of ethnology was obtained, representing some quite new forms of aboriginal construction.

Oregon and California.—From Oregon the most noteworthy collections are those furnished by Capt. Charles Bendire, at Fort Klamath.

The returns from California consist of numerous collections of shells, minerals, fossils, and archæological objects from Mr. R. E. C. Stearns.

Other specimens are birds from Mr. L. Belding, and fossils from Mr. C. R. Orcutt.

Mr. Charles H. Townsend, of the United States Fish Commission, has supplied the most extensive collection of mammals ever received from California. The collection also embraces numerous skins, skeletons, and skulls of sea lions and seals from the Farralone Islands, and of sea elephants from South California.

Arizona and New Mexico.—These Territories have been well represented; the former by the mammals, birds, and other objects of interest furnished by Mr. E. W. Nelson; the latter by an enormous collection of modern Indian pottery and other articles, made under the auspices of the Bureau of Ethnology, and others obtained by Mr. James Stevenson under similar direction.

Some contributions to the fauna of New Mexico were supplied by Dr. R. W. Shufeldt, of the Army, from his station at Fort Wingate.

Eastern portion of the United States.—The exploration of the fresh-water fish fauna of the Mississippi Valley made by Professors Jordan and Gilbert in behalf of the New Orleans International Exposition is specially worthy of mention. Several months were occupied in this service, and many hundreds of species obtained and prepared for exhibition. Dr. Palmer was detailed to collect the corals of the Florida Keys and the Tortugas. Henry Hemphill also made collections of the invertebrates of Florida.

The collections of the United States Fish Commission along the eastern coast of the United States have been noteworthy, especially those from the labors of the Fish Commission steamer Albatross in the deep waters off the coast.

General collections were made by the Albatross of the land fauna of the coast of the Gulf of Mexico as well as of the marine, resulting in the addition of a very great number of species to the National Museum, of which a noted proportion are of scientific interest. Among these may be mentioned eight new species of birds found on the islands of Curaçoa and Old Providence.

Professor Poey has continued his contributions of fishes from Cuba.

Dr. Nichols, of Dominica, has continued his donations of birds, mollusks, &c., while from Mr. Morris, director of the public gardens and plantations in Jamaica, many samples of valuable fibers have been secured.

Mexico and Central America.—Professor Alfred Dugés, of Guanajuato, Mexico, has continued his transmissions of objects of natural history, among them being some rare species of birds, &c. Mr. McLeod, of Jesus Maria, in Mexico, has also furnished some rare birds.

Mr. Romero, the Mexican minister, supplied a series of the playing cards and other gambling implements of the Mexican Indians.

The services of Louis Aymé, late consul at Merida, were secured to prosecute some investigations into the ethnology of Yucatan and Western Mexico, especially with a view of showing the relationships between the habits and manufactures of the Indians of those regions and those of the southern portion of the United States. Several large collections have already been received from him, and others of still greater moment are on the w

Other collections, especially of birds, from Yucatan have been furnished by Mr. Gaumer.

Valuable illustrations of the animal and vegetable kingdoms of Guatemala and Salvador were secured from the Government commissioners of those countries to the foreign exhibition held in Boston in the autumn of 1883. These, with similar collections under similar auspices obtained from Venezuela and Brazil, were transferred to the National Museum early in 1884.

Costa Rica.—Mr. J. C. Zeledon has transmitted specimens of medicinal plants, of birds, of vertebrated animals, and of ethnology.

Mr. R. Iglesias, of Chiriqui, has contributed antiquities and modern pottery.

South America.—Interesting collections representing the natural products of the animal and vegetable kingdoms of Venezuela and Brazil were secured from the Governments of Venezuela and Brazil. Dr. William H. Jones, U. S. N., has contributed some extremely important collections of the antiquities and natural history of the coast of Peru and Chili, and to some extent of the Galapagos Islands.

Mr. Kiefer, of Lima, has also made similar contributions.

Professor Nation has sent types of rare and undescribed species of birds of Peru.

Dr. William Crawford, U. S. N., has contributed some fine shells from the west coast of Terra del Fuego and the Straits of Magellan.

The magnificent collection of recent and fossil shells of Europe, belonging to Mr. J. Gwyn Jeffries, of London, has been acquired by the National Museum and in large part received. This is by far the most valuable private collection of European shells in existence, and especially important in possessing so many types of the deep-sea species dredged in the North Atlantic.

Among contributors to the European collections may be mentioned the Royal College of Surgeons, the South Kensington Museum, the British Museum, the Royal Botanical Gardens at Kew, in England; the Museums of Berlin and Dresden, in Germany; of Copenhagen, in Denmark; of Bergen, in Norway, &c.

Asia.—The collections from Asia have been of unusual significance and importance. Reference has been made to the accessions from Kamtschatka and the Commander Islands obtained through the efforts of Dr. Stejneger.

Mr. P. L. Jouy has continued his researches in Japan, and has supplied a large number of species of mammals and birds of that region, together with other species of animals. The collection of birds being taken in connection with a series presented by Mr. Thomas Blackiston, who spent many years in Japan, gives to the National Museum one of the most complete collections of Japanese birds in existence, and one great in value in view of their relationships to the birds of Western North America.

Rev. C. H. A. Dall has furnished samples of fibers and other native products of the Indies, and the greater part of the exhibit of the Foreign Exhibition in Boston made by Ceylon has been received; while a very valuable collection of musical instruments of East India were contributed by the Rajah of Tagore.

Africa.—This country is represented by a few objects of art and industry, while from New Guinea the collection of weapons, implements, &c., obtained from Mr. A. P. Goodwin, has added very greatly to our representation of that little known island.

The Sandwich Islands.—The greater part of the exhibit made by the Hawaiian Government at the Boston Foreign Exhibition was secured and transferred to the National Museum.

(*b*) *Chemistry.*

The chemical laboratory of the Smithsonian Institution, which was for a time transferred to the custody of the Museum, has now been as such abandoned. The chemical analyses which it is found necessary to have made in connection with the work of the Museum and the correspondence of the Smithsonian Institution are made under the direction of the chemist of the Geological Survey, Prof. F. W. Clarke, who occupies laboratories in the northeast pavilion of the Museum building, and who is authorized by the Director of the Geological Survey to carry on investigations of this character as a partial return for the accommodations afforded to the Survey in the Museum building.

(*c*) *Experimental physiology.*

Mr. John A. Ryder, embryologist of the United States Fish Commission, occupies a laboratory in the east wing of the Smithsonian building and is constantly engaged in physiological and embryological researches upon material supplied by the Museum and Fish Commission. He may, therefore, for the present be regarded as the honorary head of this department, and his numerous contributions to zoological literature are included in the bibliography of the work of the officers of the Museum.

(*d*) *Vivaria.*

A small collection of living animals is always kept up under the charge of the chief taxidermist. The collection of aquatic animals at the Government carp ponds, is still in a flourishing condition.

PART II.

REPORTS OF THE CURATORS AND ACTING CURATORS OF THE UNITED STATES NATIONAL MUSEUM UPON THE PROGRESS OF THEIR WORK DURING THE YEAR 1884.

I (A).—REPORT ON THE SECTION OF MATERIA MEDICA IN THE U. S. NATIONAL MUSEUM, FOR THE YEAR 1884.

By H. G. BEYER, M. D., *Assistant Surgeon, U. S. N., Honorary Curator.*

Accessions of the year.—During the past year specimens of drugs have been contributed to this department, principally by D. Morris, esq., director of Public Gardens and Plantations, Jamaica; Messrs. F. W. Stearns & Co., Detroit, Mich.; Mr. G. W. Jewett, inspector of drugs, New York; and Messrs. Fritzsche Bros., New York; numbering in all 406.

Method of arrangement.—When specimens are received they are, after being carefully examined, entered upon the register, and according to their condition are dried, bottled, and labeled, after which they are added to the exhibit, which is arranged as follows: First, animal products; second, vegetable products; third, products of fermentation and distillation; fourth, inorganic products; the entire collection being prefaced by an array of all the "medicinal forms" in which medicines are administered. In addition to the above there is a separate collection of Chinese materia medica.

Succeeding the general collection is an exhibit of some of the most popular mineral waters. Each of these is shown in the quantity of 10 liters, and with it each of its saline constituents, in the exact weight which analysis has shown to be present in that volume of the water; thus representing to the eye the quantity of each constituent salt ingested with a given quantity of water, and furnishing a quantitative table, without the use of figures, for comparison of the different mineral waters.

A catalogue of the collection has been printed, and a classification of the forms in which drugs are administered, by Dr. James M. Flint, U. S. N.: also will be found a "Report on the Pharmacopœais of all Nations," by Dr. Flint. No original researches have been carried on in this Department, owing to the want of necessary apparatus.

Illustrative of drug-yielding plants, there are now properly placed on exhibition 136 photographs and 350 colored plates.

During the year 1,500 labels have been sent to the printer; at present 893 are permanently attached to specimens.

Condition of the collection.—The following is an accurate statement:

Number of specimens now on exhibition	3,201
Number of specimens awaiting case room	289
Number of specimens, duplicates	300
Total number entered on register	4,442

The origin of this collection dates to 1882, when the Agricultural Department transferred to this institution the several collections of drugs which were exhibited at the International Exhibition, Philadelphia, 1876. It has, through the kindness of the wholesale drug firms of W. H. Schieffelin & Co., N. Y.; Parke, Davis & Co., Detroit, Mich.; McKesson & Robbins, N. Y.; Wallace Bros., Statesville, N. C., and others, together with exchanges with foreign museums, grown to be one of the largest of its kind.

The object of such a collection is to exhibit drugs in their crude state, and the different preparations of them, and thus serve to illustrate to what stage of perfection man has arrived in the use of medicines.

The collection at present as a whole already represents the principal drugs in most of their commercial varieties now in use by the civilized people of the world, including nearly all of the new remedies that have lately been brought to the notice of the profession. Therefore the progress of the future development of this collection of the Museum can perhaps hardly be expected to be as rapid as it has been in the past, for the majority of acquisitions will be found to consist of duplicates.

The labelling of the collection, which heretofore has been the most important routine work, has offered many serious difficulties. The principal ones may be plainly traced to two sources, viz: First, the difficulty of judiciously and carefully condensing information when such is found in abundance, so that it will only occupy the limited space allowed for each label by the Museum regulations, keeping in constant view the double end of the exhibit, which is that of a popular exhibition for the information of the general visitor as well as a scientific collection and arrangement of facts for the pharmaceutical and medical student. Secondly, the obscure drugs of which either very little is known or, at any rate, information is very imperfect. The labelling of the entire collection, which has been zealously pursued, will probably be finished during the first part of 1885.

Recommendations for future work.—It now remains to extend the usefulness and importance of this section of the Museum in a direction which, from the natural course of events, it must go to bring it up to the prestige of that scientific institution of which, in time to come, it will, it is to be hoped, form a most important part.

Plant analysis and pharmacological experiments, or the investigation of the chemical constituents of plants and their action on the animal organism, call loudly for a recognition denied them. For the last twenty years but little has been accomplished in this line of research. Instead of taking, as it ought, a foremost place, on account of the immediate practical importance attached to its beneficial results applicable to mankind, it has lagged far behind its sister sciences, physiology and pathology. However, within the last few years it has received a new impetus. Some of our transatlantic colleagues are devoting themselves assiduously to the study of drugs and their actions. The discovery of the anæsthetic properties of cocainum chloridum is a more recent example of their success. In connection with this department it is of the highest importance that such researches should be carried on. The medical profession of this country would watch our operations with great approval and profound interest, and the *raison d'être* of this section of the United States National Museum would be proportionally increased. I would therefore respectfully and earnestly urge the necessity of providing the means for investigating this valuable stock of material now contained in the collection.

I (B).—REPORT ON SECTION OF TEXTILE INDUSTRIES IN THE U. S. NATIONAL MUSEUM, 1884.

By ROMYN HITCHCOCK, *Acting Curator.*

The collection of textile fibers and fabrics was placed under my charge in November, 1883, at which time there was a large accumulation of material in the Museum pertaining to this department, which was stowed away in drawers and boxes. Much of this material was of value, some of it worthless, and it required no little labor to classify and arrange it for display. When this work was begun there was scarcely a single case of textiles on exhibition properly arrranged and labelled. There are now not less than thirty sliding-screen cases completely filled with specimens, each one of which is labelled either with a permanent printed, or a temporary written, label. By far the greater number of these have been mounted during the year 1884. In the beginning of work in this department many difficulties were encountered. It was necessary, first of all, to devise a system of classification for fibers and fabrics which would be comprehensive. As regards vegetable fibers, various systems were considered, in the hope that a scientific classification might be found which would serve well for industrial purposes; but a brief study of the subject clearly showed the impracticability of such a scheme. Turning then to purely artificial systems, it is not necessary to refer to the merits and demerits of those which have been proposed from time to time, but merely to say that the system which has seemed best for museum purposes is based upon the position of the fibers in the plants. The plan of classification adopted for textile fibers is as follows:

	Type.
Mineral fibers	Asbestos.
Vegetable fibers:	
Grasses, stems, barks, &c., used in the natural condition	Esparto.
Stem, leaf, and root fibers:	
Bast fibers	Flax.
Foliaceous fibers	New Zealand flax.
Seed fibers	Cotton.
Animal fibers:	
Wool	Sheep's wool.
Hair	Cow's hair.
Silk	Silk.

Far greater difficulty has been found in classifying textile fabrics, owing to the technical knowledge of the methods of manufacture required to do this work in a satisfactory manner. No system has yet been perfected, although a general plan has been under consideration for some time, and it will doubtless be possible to outline a satisfactory scheme in the course of another year. Meanwhile specimens are being mounted, described, and arranged in the cases according to a provisional classification, based primarily upon their composition (whether of cotton, flax, wool, silk, &c.), and secondly upon the method of weaving.

Accessions of the year.—The following are the most important among the additions to the collections for the year 1884:

Twenty-two specimens of jute, grown in Mississippi from seed obtained in India, showing various qualities of the fiber in different stages of preparation. From Hon. W. W. Stone, Stoneville, Miss., president Delta Jute and Fiber Company.

Six specimens, showing the process of manufacturing gunny cloth from Calcutta jute butts. From Mr. Appleton Sturgis, New York.

A large collection of cordage made of jute, and a fine specimen of jute fiber, from the Schlichter Jute Cordage Company, Philadelphia, Pa.

Forty specimens of textile fibers and fabrics of various kinds from different countries, all well named and identified. From the Royal Botanical Gardens, Kew, England.

A collection of machine-made laces of various kinds, lace mits, nubias, &c. From A. G. Jennings & Sons, New York.

A large number of textile fibers and fabrics, from Guatemala and San Salvador, received from the Boston Foreign Exposition, of 1883.

Thirteen specimens of textile fibers from Jamaica, collected by Mr. V. P. Parkhurst, who was engaged as collector on the occasion of a visit to the West Indies.

Twenty-nine specimens of English laces, made in Nottingham and Devonshire, England, a list of which will be found in No. 24 of the "Proceedings" of the Museum. From Mr. A. Robertson, with Messrs. Hitchcock, Williams & Co., London.

Twenty-two small samples of English silk fabrics, manufactured in Manchester and Bradford, and one hundred similar samples of cotton and worsted fabrics, etc. Also from Mr. A. Robertson.

A fine specimen of Jacquard weaving in silk. From Prof. T. C. Archer, director of the Edinburgh Museum.

Nine specimens illustrating the manufacture of hand-made ingrain and rag carpets. From Mr. O. Herring, Maryland Mills, Baltimore, Md.

Thirty-seven specimens of rope and twine made of American, Russian, and Italian hemp and sisal. From J. T. Bailey & Co., Philadelphia.

A series of fifteen specimens of flax and flax twines manufactured at Schagticoke, N. Y., from flax grown in New York State. From Mr. E. W. Hartshorn, president Cable Flax Mills.

Twelve specimens of rough and hackled flax, French, Irish, Dutch, and Canadian. From the Barbour Flax Spinning Company, Paterson, N. J.

A series of thirty-seven specimens illustrating the manufacture of raw silk fabrics in the United States. This collection begins with the raw silk as imported from Italy, Japan, and China, and shows the various stages in the preparation of the silk for the loom. The series is an interesting one because the successive steps in the manufacture are so well shown. Then follow specimens of the finished goods, plain or brocaded, in considerable variety. Received from John N. Stearns & Co., of New York.

Fifteen specimens of raw silks, as imported from Lombardy, Cevennes, Piedmont, Japan, and China, carefully selected as typical samples, and presented by C. Adolphe Low & Co., of New York.

Seven specimens of tapestry Brussels carpets. From the Roxbury Carpet Company, Boston, Mass.,

Specimens of "Napier matting" and "hemp carpetings" made of jute. From the Dolphin Manufacturing Company, New York.

Specimens of *Yucca brevifolia* and various kinds of paper made therefrom. From R. E. C. Stearns, Washington, D. C.

Fifteen specimens of fibers, mostly of animal origin. From the custom-house, Boston, Mass.

A set of specimens of knit worsted fabrics, astrachan, Jersey cloth, stockinette cloth, &c., manufactured in Philadelphia. From John E. Hanifen & Co., Philadelphia, Pa.

A very valuable collection of 117 specimens, illustrating the manufacture of worsted yarns used in the goods made by the Arlington Mills, and specimens of fine cotton yarns made at the same mills. This is a collection worthy of more than a passing notice. It was prepared with great care and judgment by the superintendent of the mills, Mr. W. D. Hartshorne, for the purpose of showing the successive stages in the manufacture of yarns from wools of different grades. Beginning with a certain grade of wool the process is followed from the greasy wool through the preparers, combs, gill-boxes, etc., and made into tops. The manufacture of colored top from the same grade of wool is likewise fully illustrated by samples of fine Australian wool in successive stages from greasy wool through the scourer, carder, back-washing, gill-boxes, comb, and finishing gill-boxes. Then specimens of tops of various grades are shown, and the processes of reducing top to yarn are illustrated by three distinct series of specimens representing three different grades of wool. Then follow numerous samples of yarns.

An equally complete and more comprehensive series of specimens illustrating the manufacture of worsted and cotton yarns, and also of the finished fabrics and the process of calico printing has been received from the Pacific Mills, and will soon be mounted for exhibition in the Museum. This collection likewise begins with the wool in the grease. Six varieties and mixtures of wool are represented by large samples, and these are each carried through the successive stages of manufacture, washing, carding, combing, etc., to the finished yarn.

The manufacture of cotton yarn is likewise illustrated, two grades being carried through the various operations in parallel series, the specimens being carefully chosen to represent the processes as completely as possible.

Calico printing is illustrated by specimens of cloth before and after bleaching, after printing, with color set, and finished. There is also a copper print-roller, taken from the machine, and the process is still more fully illustrated by photographs taken at the mills by the acting curator on the occasion of his visit during the summer.

There is also a fine set of samples of cotton goods, worsteds, and delaines, representing the large variety of fabrics manufactured by the Pacific Mills.

The manufacture of woolen goods, fancy cassimeres, etc., is represented by two collections, the first from the Harris Woolen Company, of Woonsocket, R. I., which begins with the raw wool, and a few samples showing the material in the course of preparation and spinning into yarn. Then follow specimens of worsted fabrics and wool-mixed dress goods. Another collection from the Lippitt Woolen Company, also of Woonsocket, embraces a variety of fancy cassimeres. Both these collections will soon be on exhibition in the Museum.

A series of sixteen specimens of fabrics of English manufacture, including such as seal-cloth and astrachan, was presented by Mr. H. Herrman, of the firm of Herrman, Sternbach & Company, of New York. These specimens, valuable in themselves, are worthy of especial mention because of the information concerning the methods of manufacture which accompanied them.

The manufacture of ginghams is represented by a good collection from the Whittenton Manufacturing Company, Taunton, Mass., embracing a considerable variety of cotton fabrics, plaids, cotton cassimeres and tweeds, fancy shirtings, tickings, etc.

An interesting collection, illustrating the manufacture of hair-cloth from horse-hair has been received from the Pawtucket Hair-cloth Company. This shows the rough hair as it is received in bales from South America and Siberia, the hackled hair, curled hair, hair prepared for the loom, and samples of the woven cloth.

A valuable set of specimens has been received from the Bigelow Carpet Company, illustrating the manufacture of Brussels and Wilton carpets. Beginning with the carpet-wools employed, the manufacture of yarns is first illustrated by specimens of washed wool, slivers, noils, roping, and dyed yarns. Then follow specimens of carpets and borders, in Brussels and velvet carpets.

The foregoing collection is supplemented by some specimens of carpets of the same kind from the Lowell Manufacturing Company, which includes also ingrain carpets of the same manufacture.

The Roxbury Carpet Company has presented some fine specimens of tapestry Brussels carpets, thus making the collection to illustrate carpet manufacture quite comprehensive.

A perfect working model of the original cotton-gin invented by Eli Whitney has been received from his son, Eli Whitney, of New Haven, and is on exhibition in the Museum.

The routine work of the year.—The work of the acting curator consists in obtaining and selecting material for exhibition, classifying and arranging it for the cases, collecting information about textile industries generally, and applying such information to the preparation of labels for the specimens. During the year work of this kind has been greatly facilitated by the means afforded for visiting mills in the East as collector for the New Orleans Exposition. Through the courtesy of treasurers and superintendents of several of the largest mills the writer was enabled to spend much time in studying the processes of spinning and weaving, with great advantage to the work in the Museum. At the same time photographs were taken of machinery in use, which are of great value in illustrating the processes as they are described on the labels in the Museum.

For special courtesies of this nature the Museum is indebted to Mr. H. Saltonstall, treasurer of the Pacific Mills, Mr. W. Whitman, treasurer of the Arlington Mills, Mr. C. Fairbanks, treasurer of the Bigelow Carpet Company, and to various other firms and individuals whose mills were visited with interest and benefit.

An important part of the curator's duty is to make microscopical investigations of fibers of all kinds, with reference to their value for various purposes, and particularly as to their adaptability to textile purposes. It has been impossible to conduct any systematic work of this kind during the past year, owing to the want of time, and the microscope has only been used occasionally for the purpose of identifying specimens. It will be necessary, however, to employ the microscope more frequently in future, for the work will require it.

But little attention has been given to any but the exhibition series of specimens during this year. It is doubtful if a comprehensive study series would be of value in the Museum. A set of fibers of all kinds and from different localities, that can be always accessible for examination, is, however, very desirable, if not absolutely necessary, and it is intended to prepare such a series without delay.

The microscopical appearance of the more important textile fibers will be shown by means of photographs from the microscope in connection with the fibers themselves as soon as time permits. To this end, some preparations were mounted for microscopical examination by Mr. Harry English, during his connection with the Museum, and it is expected they will yield fine photographs.

Researches.—No original investigations have been conducted in this department, the routine work demanding all the time to the exclusion of other interests. A list of the vegetable fibers in the collection was published in No. 24 of the "Proceedings" of the Museum, but since this was prepared the collection has largely increased.

A complete list of vegetable textile fibers, with common, local, and botanical names, alphabetically arranged, is in course of preparation, but it will not be published for a year or more. This list will give also the classification of the fibers according to the system adopted in the Museum.

Present state of collection.—During the year 1883 our Smithsonian collection specimens have been catalogued. All of these are not, however, desirable for exhibition purposes. There are now on exhibition, approximately, 2,000 specimens.

The number of duplicates and of specimens in the study series cannot be satisfactorily estimated at this time.

Recommendations and remarks.—To increase the interest of the collections, to make them more instructive and intelligible, it seems desirable to make use of photography to illustrate the textile industries, even to as great an extent as has been done already in illustrating the fisheries. What little has been done has enabled the curator to judge as to the value and practicability of such a scheme, and since it does not involve the employment of a photographer, but only some additional work on his own part, it is recommended that every facility should be given to carry out the scheme in a satisfactory manner. The plan advised, taking the subject of cotton for example, is to begin with the cotton in the field and follow it through its entire commercial history by photographic representations of the picking, ginning, baling, shipping, and handling until it reaches the mills. There it is also followed through the various machines, until it is finally photographed in the piles of woven fabrics in the warehouse ready for market.

One great want which is severely felt in this department is that of books of reference regarding textiles.

I (E).—REPORT ON THE SECTION OF NAVAL ARCHITECTURE OF THE U. S. NATIONAL MUSEUM FOR 1884.

By JOSEPH W. COLLINS, *Honorary Curator.*

REVIEW OF IMPORTANT ADDITIONS DURING THE YEAR.

The number of accessions during the year, both of models, full-sized boats, and boat and vessel equipments, has been large, and generally of an important and interesting character. A considerable portion of these accessions was collected for exhibition at the International Fisheries Exhibition held in London in 1883, where also many very interesting and valuable objects were obtained, some by exchange with other countries, while others were presented to the Museum. Although these collections of American craft and their equipment were made in 1882 and 1883, and the exchanges and donations received from the London Exhibition were made prior to the close of the past year, the various objects did not reach this country until after the close of the exposition, and become available to the Museum until after the beginning of 1884. We therefore feel justified, while preparing this, the first annual report of this department, in considering all the material gathered in 1882, 1883, and 1884 as coming under the head of the accessions for the present year. Elsewhere the general character of the material gathered, and its relation to the present condition of the collection, will be more fully discussed. Here it is proposed to give only a review of the more important additions to the collection, with such notes as may be deemed desirable to show from what sources they were obtained, as well as to give an idea of their value and importance.

There have been collected in the period above named, 1882 to 1884, inclusive, 123 models and full-sized specimens of vessels and boats of North America, chiefly, however, such as are used in the United States; 30 models and full-sized specimens of foreign fishing boats; 12 large India-ink and crayon sketches (30 by 40 inches) of American fishing boats; 92 photographs of fishing craft of the United States; 4 water-color sketches of vessels of the fifteenth, sixteenth, and seventeenth centuries; 8 photographic negatives of merchant vessels of the United States in the period between 1805 and 1845; 1 water-color sketch of a merchant bark of 1844; 1 photographic negative of a naval battle, war of 1812–'15; 5 oil paintings of modern vessels; 1 sketch and 2 prints of vessels; 1 model of a life-car; and 165 accessions of boat-building material and boat fittings. Many of these last accessions, though mentioned under a single number, contain a dozen or more objects which make up a complete set.

The following objects may be alluded to as being of the greatest importance among the accessions to this department:

(1) A collection of 4 rigged models, a fishing ketch, chebacco boat, pinkie, and square stern Marblehead banker, showing the early forms of vessels used in the fisheries of this country from its settlement up to, and including, the first quarter of the present century. These are especially interesting, not only as an illustration of certain degrees of evolution in the form of fishing vessels, but also to show the peculiarities of the schooner, rigged in its more primitive form, after it was first invented at Gloucester, Mass.

(2) A series of builders' models, illustrating the changes in the form of fishing vessels, from 1835 down to the extreme clipper of the present day. This collection is divided into three groups: one illustrating the development of the cod-fishing schooner, or Grand Banker, which is generally somewhat fuller than other fishing vessels; a second group showing the changes made in the "medium-sharp" type, and the other group is composed of models which were the extreme sharp vessels of the several periods when they were built.

(3) A sectional model of the schooner "Gertie Evelyn," of Gloucester, Mass., which illustrates very fully the interior arrangements of a modern fishing schooner. In my opinion no object in the collection under my charge is more instructive than this.*

(4) A rigged model of a three-masted cod-fishing schooner, such as are now used from some of the New England ports, and which are the largest vessels employed in the food fisheries on the Atlantic coast.

(5) A builder's model, mounted in medallion, of an ideal fishing schooner, made deeper and somewhat narrower than the average New England schooner, and designed to secure greater safety in rough weather, particularly when employed in the winter fisheries. This model is of especial interest at the present time, since it is believed by competent authority that a very considerable percentage of the losses of life and property which so frequently occur in the fishing fleets of New England, might be obviated by the employment of vessels of greater depth than those now in use. A fruitful source of disaster is doubtless the liability of the present type of schooner to capsize or to be tripped by a heavy sea, and its inability to right again, owing to the lack of a low center of gravity, which only depth can give, and an unusual length and weight of spars.†

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* Reference is made to the descriptive label of this model, appended to this report, which will give a better idea of its value.

† See descriptive label which is appended, for detail of this model.

(6) A series of 22 models of fishing boats, canoes, dugouts, &c., used in the United States, both by aboriginal and white fishermen. This collection has been drawn from various sources, but more particularly from Alaska, and from the Atlantic coast, between Eastern Maine and Washington, D. C. It is of especial interest, as, combined with other material of a similar nature previously acquired by the Museum, it makes up a collection representing nearly all of the more important types of the smaller fishing craft used in the United States and its Territories. The greater part of this collection has been purchased, though in this as with other material, the Museum has been the recipient of numerous donations.

(7) A collection of 4 full-sized fishing boats and 10 models of fishing craft of the East Indies has been presented to the Museum by Surgeon-General Francis Day, F. L. S., late inspector of Her Majesty's fisheries in India, and commissioner from India to the International Fisheries Exhibition at London, 1883. This is an exceedingly interesting collection, and without question it may be safely asserted that it forms one of the most valuable accessions received by this department of the Museum during the current year. Almost every specimen of either full-sized boats or models shows some interesting peculiarity, which, if space and time permitted, would merit a longer notice than we are able to give it here. A brief mention of them must suffice. Perhaps the most interesting of the various forms is that of a full-sized dugout used at Patna, in Bengal, where it is locally known as the "etka." This boat is made from the stem of the semul tree (*Bombax malabaricum*), and is very primitive in its construction, being, in fact, simply a large, elongated, trough-shaped canoe, unlike any other in the large collection of dugouts in the Museum.

Another very unique type of fishing boat, and perhaps one of the most peculiar dugout canoes used by man, comes from Jessor, in Bengal, where it is locally known as a "donga." This is constructed from the stem of the tar palm tree (*Borassus flabelliformis*), the hard outer layer of which, after the soft portion is scooped out, is very serviceable for this purpose. It has much the appearance of an exaggerated spoon, with a deep bowl and a large handle, the latter concaved on one side and convexed on the other, its end stopped or rendered water-tight by a partition placed crosswise. The shape of the boat is due to the peculiar growth of the stem of the tar palm, which swells out into a rounded bulb-like form at one end. When it is said that the length of this curious boat is less than 13 feet, and that it is only 30 inches wide in its broadest part and does not average more than a foot in width for about two-thirds of its length, one will be fully able not only to appreciate the manner in which man adapts means to ends to provide himself with some sort of craft for carrying on his operations, but will also be able to understand that a considerable degree of skill is required to navigate a boat of this kind.

A full-sized catamaran (13 feet long and 3 feet wide), such as is used for fishing in the Presidency of Madras, is another very interesting addition to the collection of primitive types of water craft. Rudely constructed of logs, and apparently as illy adapted as anything well can be for encountering rough water, craft of this kind are nevertheless said to be very serviceable for crossing a heavy surf, and it is stated that they will make a landing in breakers which would prove the destruction of any ordinary boat that should dare to make a similar attempt. It is said that these rafts rise lightly over an ordinary surf, but if caught by a great breaker are overwhelmed and knocked about. At such times the natives, who are semi-amphibious in their habits, will leap overboard, and after their vessel has passed the surf they will clamber on to her again, and go on as if nothing had happened.

Among the models of East Indian boats there is a very remarkable one of a fishing craft used at Chittagong, in the Presidency of Bengal. This is a long and narrow dugout canoe with scoop-shaped, narrow, square ends. Its special peculiarity consists in an arrangement for catching fish automatically. On one side of the boat is a broad bamboo platform, fixed to the gunwale in such a manner that it projects out into the water, and to this is attached a string of palm leaves something in the form of a broom. This strange device, when slightly agitated by the motion of the boat, has the effect of frightening any fish that may be near and which immediately jump upon the half submerged bamboo platform, and thence into the boat, where they fall among the branches of trees with which the canoe's bottom is strewn. The fisherman sits on the gunwale with one foot in the water and heels the craft to the proper angle, or gives it the requisite motion for frightening the fish. To prevent the fish from leaping over the other side of the boat, and thus regaining their liberty, a net is fixed obliquely or vertically along the opposite gunwale, and serves as an effectual barrier to their escape.

The most interesting model, perhaps, which has been received in this collection of Indian water craft, is that of the Bombay fishing boat known as the "machva" in the region where it is used. No boat in the world is more distinctive in type than this, and there are, perhaps, few others which would sooner attract the attention of those who are familiar with vessels. In the shape of its bottom the "machva" differs from all other boats, and the peculiar form of its keel is seemingly at variance with all of the recognized rules of naval architecture. The keel curves upwards in the center in an arch-like shape, and is deepest at the bow, where it forms nearly a right angle with the straight raking stem; it also drops down aft considerably. This boat, which is carvel built, of teak, has a long, sharp, scoop-shaped bow, resembling in its form the forward section of an Arab dhow. The deep projecting keel serves the same purpose as a double center-board for providing the requisite lateral resistance when the boat is sailing close hauled. The rig consists of a single short, stout mast, stepped almost amidships, and having a strong rake forward. Upon this is spread a large settee sail, which tacks down to the bow.

The "machva" is credited with being the swiftest of Indian sailing craft, and a claim has been made that boats of this type could beat English yachts. Dr. McDonald, secretary and curator of the Victoria and Albert Museum, Bombay, says, "The fishing boats of the Konkan are considered to be amongst the swiftest sailing vessels known." It is believed by the native fishermen that the sailing qualities of their boats are materially improved by the shape of the keel. It would appear, too, that they are correct, strange as it may seem, for Biddle, in his "Model Yacht Building and Sailing," tells us that "some experiments were tried with this type of vessel a few years back. The arch was filled up and the sailing qualities of the craft immediately destroyed." He also says "They do not go to windward so well as an English yacht, but in running and reaching they cannot be surpassed, especially in smooth water." Dixon Kemp, however, in "Yacht and Boat Sailing" (4th edition, p. 350), expresses the opinion that the stories about such craft beating boats of English design must be taken with considerable allowance.

The following interesting account of the ceremonies attending the launching of a new boat of this class is given by Dr. McDonald: "When a Koli builds a new boat, or 'machva,' he gives a dinner to his friends and relatives on the occasion of its being first launched. The fermented juice of the palm tree is freely drunk by the guests invited on such occasions. The women, too, honor new boats with reverence and break cocoanuts upon the boat's bows, pretty much as champagne bottles are broke at home on like occasions."

Other models in this collection of East Indian boats, particularly the Madras "masulah" boat, and two of those used at the Maldives and Aden, are interesting as showing the peculiar method of sewing the planks together with coir twine, which is a characteristic feature of many of the fishing craft used by the natives of the East.

(8) We have obtained from the Government of Greece a collection of the fishing boats of that country, consisting of one full-sized specimen and two models. It is interesting to note that two of these boats, a fishing skiff, and a sloop from the island of Sciathos, resemble craft used in the United States. For instance, the skiff might be easily taken for one used by gunners in the Chesapeake and its tributaries, while on the New England coast sloop boats could perhaps be found which would not be very much unlike that employed by the Grecian fishermen. The most interesting model in this collection is that of a Grecian boat employed in the net and seine fisheries. It is sharp aft, and finely proportioned. Its striking peculiarity, however, is a projecting cut-water or "ram", which seems to be the last surviving relic in the Grecian boats of the "ram's head," or cut-water, which adorned the

bows of the ancient triremes, and which on the latter was used for offensive purposes (like the projecting rams on modern men-of-war), for crushing the sides of their antagonists. This boat is propelled wholly with oars, having eight rowers on a side.

(9) A collection of seven fine models of Chinese cargo boats and fishing craft has been obtained from the Museum of Fish Culture at South Kensington, London. These models are a valuable acquisition to the Museum, and combined with others previously acquired make up an interesting collection representing the craft of the Celestial Empire. It is possible in this place to make special mention of only two of the models as being of peculiar interest. One of these, a so-called "outrigged" fishing junk, from South Formosa, is a remarkably clumsy craft, even for a Chinese junk, and judging by descriptions that have been given, it is probably a fact that this style of vessel has not changed much in its form or in the method of its construction since the days of Marco Polo. The other is a bamboo raft, or catamaran, a style of boat employed in China as elsewhere (in South America and India) not only for fishing purposes, but to go on and off the coast when the surf is so heavy as to preclude the possibility of using the ordinary form of boat.

(10) A full-sized dugout canoe, such as is used on the Gold Coast of Africa, has been presented to the Museum by Mr. Maloney, governor of the Gold Coast colony. As being the only full-sized representative we have of water craft used by the natives of Africa, this canoe is of especial interest and value to the collection. It also has an additional importance from being another interesting accession to the collection of primitive boats used by man, particularly of those which come under the head of dugout canoes.

(11) An Irish "curragh," exhibited at the London Fisheries Exhibition, has been presented by the Marquis of Hamilton. This boat, made of tarred canvas stretched over a light frame-work of willow withes, is probably the most primitive form of water craft used by civilized man, and it constitutes an interesting "connecting link," if we may so call it, between the boats of a remote age and the higher types of vessels in use at the present day. Remarkable as it may seem, craft of this kind are still in common use for fishing purposes on the west coast of Ireland, and are perhaps as fine an illustration of the adaptation of means to ends as can be found even among the varying forms of boats used by savage tribes; for here the poor fisherman, not able to afford the expense of building a more durable craft, with the limited means at his command, makes himself such an one as may answer his purpose. Though extremely frail in appearance, these craft, from their lightness, are very buoyant, and it is said of them that they will rise like a feather upon waves which would prove troublesome, if not dangerous, to the ordinary fishing boat.

(12) Two full-sized British "corracles," one from the river Boyne in Ireland, and the other from the river Dee in Scotland, which have been

obtained by exchange, may be reckoned among the valuable additions to our collection in this department. These are oval-shaped boats about 5½ feet long and two-thirds as wide, the depth being about 18 inches. The Boyne corracle is made of leather, fastened to a basket-like frame of willow withes, while the Scotch corracle is constructed of breadths of tarred canvas drawn over a light framework of thin, flat, wooden strips. Each of these corracles has a single thwart, placed nearly amidships, upon which the occupant sits to paddle the boat.

(13) Among the interesting novelties received by the Museum during the current year might properly be included a model of a Belgian fishing sloop, which was purchased at the International Fisheries Exhibition at London, and which represents the peculiar style of boats used for beam-trawling, &c., from certain ports on the coast of Belgium, but particularly from Heyst and Blankenberghe. This boat, which is designed for landing on a beach, and is, therefore, flat-bottomed, and like the Dutch bomschuited, very broad and full, differs, in the form of its hull and its rig, from any other fishing boat used by man at the present time. This model is rendered doubly interesting by having attached to it the peculiar forms of fishing apparatus used by the Belgian boats, and also because there are a number of figures of fishermen in it.

(14) The collection has been enriched by an accession of four water-color sketches of ships of the fifteenth, sixteenth, and seventeenth centuries, which are of especial interest as being connected with the early history of America. One of the sketches represents the ships of Columbus, according to the highest French authority, which by the closest students of naval architecture of that period are believed to be the most accurate and reliable. Another very interesting sketch is that of the Mayflower under sail, on her passage from England to America in 1620. This is probably the most accurate sketch of the Mayflower that has ever been made, since it is derived from a study of many years of the various peculiarities of the English and Dutch vessels of that period. A third sketch represents a "carrack" of the sixteenth century. Hippus, the Tyrian, is credited with having first devised carracks, which are described as vessels of great size, designed for both trade and war. The same name was given also by the Portuguese and Spanish to a class of vessels which they sent in the sixteenth century to the East Indies and Brazil, and which doubtless visited other parts of America. These vessels were large and full, of great depth, and were designed for fighting as well as trade. The fourth sketch is that of a Spanish "galleon" of the sixteenth century (1520). In their traffic with America, galleons were much used by the Spanish as treasure ships during the sixteenth century. They were always heavily armed, but it is said that owing to their unwieldiness they generally fell an easy prey to their assailants.

(15) D. J. Lawlor, naval architect, Chelsea, Mass., has presented the Museum with a fine collection of 17 models of various styles of vessels.

Among these may be mentioned, as of especial interest, 8 models which show the evolution of the American pilot-boat from 1845 down to October, 1884. In no department of naval architecture have our shipbuilders shown more originality than in the construction of pilot-boats, and perhaps nowhere else, either in this or other countries, has there been a higher combination of speed and general sea-going qualities than has been characteristic of the vessels of this class employed on our Atlantic coast. In this collection, perhaps, more than in any other that might be gathered, are illustrated the ideas which have influenced the minds of designers of small, swift, sea-going sailing vessels during the past forty years. Passing through various changes of greater or less importance, the writer is of the opinion that, in the model of the pilot-boat Hesper, of Boston, very high results have been attained, so far as a combination of speed, symmetry, and sea-worthiness is concerned.

Another model in the collection obtained from Mr. Lawlor is that of the steamship Meteor, which has a very interesting history. She was built by subscription from merchants of Boston, New York, and elsewhere "for the purpose of offering her to our Government for the pursuit of the Alabama and other blockade runners, then preying upon our commerce and carrying stores to the enemy, in defiance of our more heavily armed ships of war."* The design for this ship was offered in competition, the competitors being Henry and William H. Webb, of New York, and D. J. Lawlor, of Chelsea, Mass. One hundred dollars bonus was offered as a prize to him whose design was accepted. The model made by Mr. Lawlor, and which he has presented to the Museum, is the one which was accepted, and from this the ship was built at Portsmouth, N. H., and launched on May 21, 1864. "She was designed to carry one heavy pivot amidships on gun deck, or two 10-inch or other guns at the same point, namely, just before the mainmast; forward of this are four ports (two on each side) where 8 or 9-inch Dahlgrens would have been mounted had she been taken by the United States Navy Department, and abreast of the engine hatch aft there are two ports on each side where she could have mounted short 32's or 24-pound howitzers, and on the upper deck are beds for two 30-pound Parrotts, making one pivot 11 inch, or two 10 inch; four broadside, 8 or 9 inch; four 32 or 24-pound howitzers, on gun deck; two light chase guns on upper deck. She has two 62½ by 36-inch cylinders; four tubular boilers; propeller of brass, 13½ feet diameter and 23 feet pitch. The motive power, boilers, &c., were imported from Scotland at a very large cost." †

"The Meteor was a steamer of 1,440 tons register, old measurement, being about 400 tons larger than the Alabama; and when tested by the

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* Report of the case of the steamship Meteor, Vol. 1. Edited by F. V. Balch, Boston, 1869.

† Extract from letter of R. B. Forbes to Frederick C. Schmidt, esq., New York, dated Boston, September 13, 1865.

Navy Department made the best time between the trial buoys off Sandy Hook which had then ever been made by any screw ship, being one or two miles an hour faster than any of the rebel cruisers; but just when the Government was about taking her, the fall of Fort Fisher rendered her no longer necessary for her original purpose, and, after two or three voyages in the transport and merchant service, she was laid up and offered for sale in New York in the summer of 1865.

"In the autumn of 1865 Spain made war upon her former colonies, the states of Chili and Peru, whose independence she had never formally acknowledged, and it soon became known that the South American Republic wanted ships.

"There was every reason why the owners of the Meteor should be ready to sell her to our South American neighbors whenever they could properly and lawfully do so."*

Negotiations were carried on with this purpose in view, but when all ready to sail with her stores and crew on board, "the Meteor was seized on the 23d of January, 1866, by the United States marshal, at the instance of Spain," and for about two years was held in litigation by the Government of the United States for alleged infringement of neutrality laws, the final result of the suit, however, being in favor of the owners of the ship.

Outside of the purpose for which she was originally built the model of the Meteor is interesting as being a ship of unusual speed for the period when she was designed. It is related of her that she has made an average speed of 15½ knots an hour, with a disconnected screw, for a period of 72 consecutive hours.

In the collection received from Mr. Lawlor are two fine models of steam yachts, which illustrate the advance which has been made in designing these types of pleasure craft.

(16) In a collection of 5 models of various kinds of sailing and steam craft, presented to the Museum by Sumner, Swaysey, and Currier, of Newburyport, Mass., is an interesting model of the screw steam packet Decatur, built about 1844, and which may be considered as a fair representative type of the earliest forms of screw steamers employed in the United States.

(17) We have received from John N. Cushing, of Newburyport, Mass., a collection of 8 models of merchant vessels (brigs, barks, and ships). Of these two are of especial interest. One of them is the model of the brig Palos, of Newburyport, built in 1832. From this model, which is one of the best examples extant of the old-style "kettle-bottom," a fleet of 12 or 14 brigs were built, these being employed chiefly in the European trade. They were extremely full, deep, and narrow, with a great deal of "tumble home" to their top sides. This peculiar shape was due chiefly to the tonnage laws then in vogue, by which one-half of the length of the main beam was taken from the depth of the vessel.

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* Report of the case of the steamship Meteor.

It will consequently be seen that a vessel which was of extraordinary depth and very narrow on deck would have an exceedingly great carrying capacity in proportion to her tonnage. It was, therefore, the custom of some merchants to build their vessels of this type for the foreign trade in order to escape as much as possible the payment of onerous tonnage dues in the various ports which they visited. As an instance of the great carrying capacity of the brigs built from this model, the story is told that one of them, the Keying, of a little less than 300 tons burden, landed 700 tons of coal in Jamaica, which she had brought from Cardiff. A second model of special interest in the collection received from Mr. Cushing is that of a Baltimore clipper brig of 1845. This model, which was designed for a vessel of about 255 tons, is in an excellent state of preservation, and gives us a very good idea of the extreme clipper vessels of the period when it was constructed. One other model, that of the brig Dove, built in 1817, is also worthy of mention. This is the earliest form of a square-rigged vessel of which we have a builder's model.

(18) A beautiful builder's model of the ship Oregon, of Bath, Me., has been presented to the Museum by Mr. William Rogers, of Bath. This model is an excellent representative of the type of "half clipper" ships of the present day, which for the general purpose of trade now existing have been found the most useful. As the result of many years' experience, the ship-builders of to-day have succeeded in combining in a very high degree excellent sailing qualities with great capacity. Therefore a vessel is obtained which may make rapid passages and carry a cargo sufficiently large to pay her owners a good freight. This ship may be taken as a fair illustration of the highest type of the cotton carriers of the present day, in which trade, we are informed, she has been employed to a greater or less extent.

(19) Mr. William P. Pattee has presented to the Museum four rather interesting models of old style merchant vessels, and, together with Mr. F. W. Weeks, has given us a fine builder's model of the ship Glasgow, built at Bath, Me., in 1836, and employed in the cotton trade between New Orleans and Liverpool. This model is mounted on a board, with head, keel, rudder, &c., attached, and is painted in the same manner as the ship which was built from it. It is especially valuable as representing the finest type of cotton carrier of the period between 1830 and 1840.

(20) Five models of modern merchant vessels, four of which are three-masted schooners, have been given to the Museum by C. P. Carter & Co., Belfast, Me. This collection is chiefly interesting from showing different forms of three-masted schooners employed in various trades. Two of these, the Meyer and Muller, and the Nellie S. Picking, represent the wide, light-draught type of vessel employed in the coasting trade of the South Atlantic and Gulf ports, where the harbors are generally

shallow, while other models illustrate the characteristics of the deeper sea-going schooners engaged in the general ocean traffic.

(21) No more interesting addition has been made to this collection than that of eight photographic negatives of paintings of merchant vessels of the early part of this century, from 1805 to 1845. Through the courtesy of several public-spirited citizens of Newburyport, Mass., who are the owners of the paintings, I was permitted to copy them. In a succeeding paragraph these will be mentioned in greater detail.

(22) Among the acquisitions of boat and vessel equipments the following seem deserving of special mention: (1) two nickel-plated models of steam windlasses, which have been presented by the American Ship Windlass Company, of Providence, R. I. These models represent the highest results that have been attained in mechanical contrivances for weighing ships' anchors, warping, &c.; (2) a coil (100 fathoms) of 8½-inch manila cable, such as is used by the New England fishing vessels for riding at anchor upon the outer banks. It is an interesting fact that manila has of late years entirely superseded hemp for this purpose, having been found more pliable, and in many respects preferable to hemp for cables; (3) a full gang of standing rigging for a fishing schooner, one-half full size, fitted in all its details, has been given to the Museum by Mr. James M. Simms, of Gloucester, Mass. Probably no fishing vessels in the world have so much care expended on the fitting of the rigging as do those of New England, and in this respect they will bear favorable comparison with yachts; (4) Nathan Richardson, of Gloucester, Mass., has given a full-sized sample of "Richardson's Challenge Steerer." This steerer, which is one of the many forms of patent steering wheels now in use on American fishing vessels, is one of the latest devices, and is an interesting representative type of the wheels used on the schooners of the Atlantic coast; (5) a full-sized sample of "Collins' Patent Fog Alarm" has been added to the collection. This fog alarm was originally devised for use on fishing vessels, and is believed to be more powerful than any mechanical contrivance worked by hand now in general use. It derives its chief importance from the fact that there is probably nothing more needed by American fishermen than a powerful and efficient fog-horn. Obliged to lie at anchor on the fishing banks in the direct track of commerce, especially swift steamers, and where dense fogs prevail nearly all the time in spring and summer, they are in constant danger of being run down and sunk—a danger that can only be averted by having a powerful horn that may be operated by hand. The trawl-line fisheries, too, involve the fishermen in much personal risk that can be obviated only by the use of a horn of more than ordinary power. During the prevalence of the thickest fogs the fishermen must put off from their vessels to set and haul their trawl-lines, generally going distances varying from one and one-half to three miles. The style of horns commonly in use cannot, of course, be heard more than a small portion of that distance

except when there is little or no wind. Therefore, in localities where the currents are uncertain as to their course and variable in strength, where the winds are liable to change suddenly, and where fogs are so dense and so long continued, it is not surprising that many fishermen go astray in their boats and are exposed to untold suffering, perhaps death, owing to the fact that they are unable to hear the fog-signals made on board of the schooner they have left, and which they vainly strive to find. The local papers in the fishing towns frequently record the loss of men in this manner, and the escape of others from death, simply by a hair's breadth, after enduring the most unheard-of suffering from exposure, hunger, and thirst. Various devices have been resorted to to remedy this evil, such as, for instance, carrying cannon to fire in foggy weather; but heretofore these means have failed to prevent the frequent recurrence of disaster. The chief objection to cannon is, that their discharge involves a certain amount of danger as well as expense; therefore, they are not usually fired until it is deemed absolutely necessary—that is, often not unless it is thought a dory has gone astray, and then it is frequently ineffective, because the lost men have got too far from the vessel to hear the sound. The sound of the cannon, moreover, is so short that its direction, even if the report is heard, is very difficult to determine. What, therefore, is needed is an implement that can give out a nearly continuous heavy blast, or a succession of short, heavy blasts, powerful enough to be heard at a considerable distance, and repeated at such intervals that no difficulty may be experienced in determining its location; (6) a very large collection of boat and vessel fittings, sail-maker's tools and apparatus, has been given to the Museum by Messrs. Wilcox, Crittenden & Co., Middletown, Conn. This, combined with donations previously received from the same house, makes up an extremely interesting and comprehensive collection of boat fittings, sail-maker's gear, material for building boats, &c., probably the most complete and valuable collection of its kind that is possessed by any museum in the world.

WORK IN ARRANGING AND CLASSIFYING THE COLLECTION.

There has not been, as yet, any proper arrangement or systematic classification of the material in this department. The large case and screen, which were essential for the proper display of the models, were not completed until the spring of 1883 was well advanced, and, in consequence of my time being employed very much with other matters, all that it has been possible to do was to make a tentative installment of the various objects in the collection which it was the most imperative should be placed where they might be protected from injury. It has, however, been found necessary to put into temporary storage nearly all of the collection of vessel and boat fittings.

A large portion of the full-size specimens and models of vessels and boats in the collection was either exhibited by the Museum at the

International Fisheries Exhibition at London, 1883, or obtained at that exhibition, as has already been mentioned, by exchange. Much of this material, being of a very fragile nature—particularly the rigged models—notwithstanding the great care that was exercised in packing it, was, when unpacked in the spring, found to be more or less out of repair. Lacking competent assistance, I was compelled to make the repairs with my own hands, in almost every instance, and it was only by a special effort—working late at nights for upwards of three weeks—that it was possible to make even a preliminary installment of the various objects now exhibited. To get the material into the cases, and elseelsewhere, so that it might be protected from injury, demanded, of course, my first attention, while the matter of classification, cataloguing, and the preparation of descriptive labels, could be attended to at a later date, whenever an opportunity might be afforded.

I will state here that nearly all of the material sent to London was properly catalogued and descriptive labels of most of the objects were prepared and printed. After the installation of these models in the Museum, allusion to which has already been made, I attempted to complete the entering of the various objects in my department, and also made an effort to prepare a full set of descriptive labels. Could I have had any assistance in this work, very commendable progress might have been made, and many highly valuable objects would have been so fully recorded and described as to preserve their identification, which alone can render them of any worth or importance to the Museum. But being almost wholly without assistance of any kind; obliged to continue making repairs on the models even after the first installation, and having many other matters on hand which engrossed the greater part of my time, I succeeded in doing only a very small part of the work of cataloguing and writing labels before I was called away to attend to duties that, at the time, imperatively demanded my attention; one of which was the collection of material to represent the development of naval architecture in the American merchant marine. A part of this collection has been sent to the World's Exposition at New Orleans, but will ultimately be installed in the National Museum.

RESEARCHES PROSECUTED UPON MATERIAL BELONGING TO THE DEPARTMENT.

For the reasons mentioned in the preceding paragraph, it has been impossible to prosecute any research of importance on the material in this department. In the introduction of Section I, "Catalogue of the Collection Illustrating the Fishing Vessels and Boats," &c., exhibited by the United States at the International Fisheries Exhibition, London, 1883, I have discussed in a general way the history and development of the American fishing vessels, and have spoken at length of the introduction and use of steamers in certain fisheries of this country. Brief mention has been made of certain types of fishing boats and the general collection of apparatus accessory to rigging fishing vessels, &c. This catalogue contains, in addition to the notes already alluded to, concise descriptions of much of the material in this department which more particularly relates to the fisheries of the United States.

Under the title of "American commerce" the Newburyport Herald, of November 7, 1884, published an article upon the collection of models, &c., in the Museum, and made special mention of builders' models, pictures, &c., which had been obtained at Newburyport, Mass

PRESENT STATE OF COLLECTION.

The collection in this department probably contains the largest amount of material illustrative of the fishing craft of this and other countries, and the various accessories for rigging such vessels, to be found in any museum in the world. In this direction, as well as in that of the more primitive types of water craft in use in various parts of the globe, the National Museum may fairly claim to be in an excellent condition. There is not, however, so great an amount of material representing the merchant marine and naval vessels, of even our own country, as might be desired.

So far as the models of boats and ships are concerned, nearly all of them have been placed on exhibition, but with the materials for the equipment of vessels, &c., the case is far different, as has already been indicated. With few exceptions, owing to lack of time and other causes, it has been found necessary to put these, temporarily, in storage. As soon, however, as it is practicable, this collection will be properly classified, arranged, and displayed in the Museum.

STATISTICS.

Owing to causes which have already been alluded to, I find it impossible to give anything more than an approximation of the statistics of this department, with the exception of the material now exhibited. There are now on exhibition (including a whale-boat at the New Orleans Exposition) 28 full-sized boats, canoes, corracles, &c.; 54 builders' models, which, with 32 now at New Orleans, make up a total of 86; 305 other models of vessels, boats, canoes, &c., are displayed in the Museum, and 8 models of this description are now at New Orleans, making 313 in all; 4 water-color sketches of ships of the fifteenth, sixteenth, and seventeenth centuries; 5 oil paintings of modern types of fishing vessels; 1 photograph of an English North Sea beam trawler; sketch of a full-rigged brig; 2 prints of naval vessels; 19 sketches and photographs of fishing vessels, &c.; and 88 specimens of vessel fittings and apparatus.

There are held in storage, or what might be, perhaps, called the reserve series, about 25 models and some 350 specimens of boat and vessel fittings.

As to the future development of this department there is much to be hoped for. With the space now at command it would not perhaps be possible, even if it were desirable, to display so comprehensive a collection of rigged models of merchant craft and men-of-war as we now have of the fishing vessels of this and other countries, but it is seemingly in the highest degree desirable that there should be procured, when the opportunity is afforded, a number of models representing the more important types, at least of merchant vessels. One thing should be done, or I might say should be the aim of this department, and that is to get together material which, added to the collection already gathered, may fully and fairly represent the development of naval architecture in this country, from the discovery of America up to the present time. The fishing and commercial marine, as well as the Navy, have played a most important part in the history of the United States. It seems eminently fitting, therefore, that in a National Museum, established in the capital of the country, a collection should be gathered which may form a comprehensive illustration of the progress of ideas and enterprise in the various branches of maritime affairs in which our people have engaged. While it may not be practicable or even desirable to do this by gathering together a large collection of rigged models, it is undoubtedly a fact that the plan I have so briefly alluded to might be carried out to a great extent by the use of pictures displayed on flat screens, and from a study of which one could obtain a very fair idea of the many types of craft, as well almost as from seeing the models, and there would be this additional advantage, that exhibits of this kind could be so displayed as to occupy the smallest possible space. It is my opinion that there can be very much done by the use of builders' models to show the development of naval architecture. These can be mounted at small expense and painted in the style of the vessel they represent, while by attaching a small illustration of the ship to the descriptive label, showing the rig and general appearance of the vessel under sail or steam, one could gain not only an idea of the shape of the vessel, her lines, &c., but would have impressed upon his mind her general appearance under sail. A great deal, perhaps, may be done, with the aid of the Navy Department, by getting together and properly mounting some of the many builders' models of war ships, which are now little better than old lumber in the cock-lofts of the navy-yard buildings. It is therefore desirable, whenever it can be done, that pictures of various rigs and styles of water craft should be obtained to add to those which we now have. The importance of getting together such a collection has already been referred to, so far as it relates to its being a record of the past history of commerce in this country.

By bringing together a mass of material of this character we are able to compare one type with another, and it may serve as an important school for the historian as well as for the naval architect. The latter may derive useful and valuable knowledge and suggestions from a study of foreign vessels, and by an intelligent combination of the best qualities of the craft of other countries with those of our own he may be able to devise the very highest types that it is possible to construct. Already something of this kind has been accomplished, the result being a modification of the form of the fishing vessels. Within the present year fishing schooners have been built in New England much deeper than any that have previously been in common use, and judging from the results already attained, they will be much safer, and otherwise more serviceable, than the ordinary type we have been accustomed to during the past.

While the foregoing shows what is desirable, so far as adding to the collection is concerned, I cannot refrain from stating in this place the fact that it seems of the utmost importance that the material we now have should receive more attention than it has been possible for me to give it. Since my time is so largely occupied with other duties, in connection with the Fish Commission, &c., I hope it will not be out of place if I humbly suggest the importance of my having more assistance when at Washington to aid me in arranging and classifying the material in this department, as well as in doing other necessary work. Unfortunately, as the case now stands, in spite of the utmost efforts I have been able to put forth, a considerable portion of the material of this department has not been entered on the catalogue, neither have there been prepared proper descriptive labels for many of the objects. The identification of many of the models depends solely upon my memory and the knowledge of the various craft, &c., which I have obtained by study and experience. It has been my wish to place the collection in such shape that it would be perfectly practicable for some one else to take control of it and go on with the work without any trouble or hindrance. This seems eminently desirable, since, as all men are mortal, the value of any portion of such a collection ought not to depend so much on any single individual.

It seems proper in this place that mention should be made of the importance of having descriptive and historical labels for each object. In no other way, in my opinion, can a collection be rendered so instructive and valuable as it can be by having attached to each article a somewhat comprehensive label. This having been done, a visitor to the Museum, even a child, may acquire all the more important facts respecting anything he may be specially interested in, while to the student these labels will prove invaluable. Generally a label should not only give an idea of the form of the object described and its dimensions, but it should also contain what it is used for, and the locality from which it comes, etc.; in a word, all the knowledge that one ordinarily cares to obtain. More fully to illustrate the point which we are trying to make, we insert the following samples of labels prepared for objects in this collection:

FISHING SCHOONER GERTIE EVELYN, OF GLOUCESTER, MASS.

Sectional model, port side, scale 1 inch to 1 foot. This model shows the exterior and interior of the port side of a clipper fishing schooner, such as are now employed in the general deep-sea fisheries of New England. It is specially designed to show the arrangement of the interior, such as the forecastle, cook's pantry and store-room, ice-houses for the refrigeration of fish, bait, &c., the stowage of ballast, cabin, gear-room, &c. The ice-house is built in the style which has been most commonly adopted on vessels employed in the fresh-halibut fishery or the winter haddock fishery, and with the exception that on some of the vessels the ice-house is divided into two sections—the "forward" and "after" ice-houses—by a bulkhead just abaft the mainmast, few, if any, differ from this. Comparatively few American schooners carry any other than stone ballast, and such is shown, though a few, especially those of smaller size, have some—that which is stowed each side of the keelson—iron ballast, and in exceptional cases a vessel may be wholly ballasted with iron. The forecastle, which is the sleeping apartment for a portion of the crew and for the cook, and the place where the cooking is done, and where the entire crew, including the captain, eat their meals, is finished in pine, painted and grained. Lockers run around both sides, and serve the double purpose of seats for the men and stowage for vegetables, &c. The cooking-stove sits on a platform, raised about 4 to 6 inches above the floor, at the after end of the forecastle on the starboard side. There are three lengths of sleeping berths (five berths only of which are usually occupied) on the port side, and two lengths on the starboard side, though it rarely happens that they are all filled. Besides these there are two more berths on the starboard side, aft of the "dish-closet" (which is at the side about abreast of the foremast), that are used by the cook for the storage of small stores and other material which he uses. At the after end of the forecastle, on the port side, is a small upright closet with shelves where the cook keeps a supply of eatables, which the fishermen have access to at all hours of the day and night; this is called the "grub-locker." Near this is the door leading into the forehold, where are the cook's pantry on the port side, and the coal-pen on the starboard side, and where also is stowed a supply of wood, flour, beef, pork, &c. Beneath the floor of the pantry, at least in part, are the water-casks, each holding about 250 to 400 gallons, these being supplemented by a greater or less number of barrels filled with water, which are also stowed in the forehold. In the pantry the cook prepares the food for cooking, and this apartment is often painted in a neat and tasty manner. The ice-house is separated from the pantry by a double bulkhead of matched boards with tarred paper between. The platform of the ice-house is usually made of spruce or pine planks 2 inches in thickness, these being laid on sleepers of 3 by 4 scantling, which are fitted in their proper places, well secured, and also supported in the middle before the ballast is put on board. The platform is held securely in place by the stanchions which form the framework of the pens or sections into which the ice-house is divided. Each pen is separated from the next by a single partition of one-inch boards. A portion of the front of each side pen is tightly closed up from the floor to the deck, while the remainder is adjustable, a number of "pen-boards" being cut of suitable lengths so that by sliding in grooves in the upright stanchions they may be put in or removed as occasion demands. The pens on the sides are called "wing-pens," while those in the center aisle are known as "slaughter-house pens," the one, however, which is directly under either the main or after hatch having the name of "slaughter-house." The cabin is finished with hard wood, usually black walnut and ash; it has four berths, the forward one of which on the starboard side is occupied by the captain, while the others are taken by such members of the crew as may secure them by lot, since there are no under officers to claim them by right. Beneath the cabin floor, in which there is a small trap-door, a supply of coal for the cabin stove is carried. Aft of the cabin, in the extreme stern, is a rough, unfinished apartment, where such materials as spare fishing-gear, light sails, cordage, blocks, &c., are stowed. The larger mass of fishing-gear, which is very bulky, is stowed in the ice-house when the vessel is making passages. The particular schooner which this model represents was built by Messrs. Bishop & Murphy, of Gloucester, Mass., and launched in February, 1883. She has been employed in the winter haddock fishery, carrying her catch fresh to market, a distance varying from 150 to 300 miles. She is about 82 tons register (135 tons builder's measure), and has made a good record for speed and sea-worthiness. She is from 4 to 6 inches deeper than the average American fishing schooner of the same size, has fine lines, with long, sharp bow, which is slightly concave beneath the water line; moderately full bilge; broad beam; long, finely-cut run; rather full, elliptical stern, which has considerable overhang. The relative dimensions of spars, sails, and rigging for this class of vessel is shown on the full rigged models. Gloucester, Mass., 1883. U. S. Fish Commission. 76,011.

Dimensions of original.—Length over all, 87 feet; total length of model, including stub bowsprit, 96 inches; beam (extreme), 22½ feet; depth of hold, 8½ feet; draught—aft, 9½ feet, forward, 5¼ feet; depth of keel, 22 inches; extreme length of forecastle, 22 feet; of pantry, or forehold, 7½ feet; ice-house, 28¼ feet; cabin (on floor), 10 feet; house (outside), 11½ feet. Height: Forecastle and cabin, about 6 feet under beams; forehold, 6 feet; ice-house, extreme, 6 feet, average, 5 feet.

Names of the several sections of the model.

1. Upper forepeak berth. 2. Lower forepeak berth, generally used only for the stowage of lanterns, oil cans, &c. 3. Table. This is divided into two sections, the after one of which turns back, folding around and fastening to the foremast when not in use. 4. Forecastle floor. 5. Locker. 6. Foremast. 7. Pawl-bit. 8. Heel of bowsprit. 9. Windlass. 10. Traveler. The lower jib-sheet block is fastened to an iron ring which runs on this traveler. 11. Upper middle berth, port side. The berth corresponding to this on the starboard side is always occupied by the cook. 12 Lower middle berth, port side. 13. Upper after berth. The berth corresponding to this on starboard side is not so wide, and is used only for storage of small stores, &c., as is the one next below it. 14. Lower after berth, sometimes called "slaughter-house" berth, because of its exposure to cold drafts of air in the winter from the forehold and companion-way. 15. "Grub closet." 16. Entrance to forehold. 17. Steps. 18. Water cask. 19. Pantry floor. 20. Flour barrel. 21. Beef barrel. 22. Cook's bread-board. 23. Shelves for boxes, firkins, &c. 24. Ice-house bulkhead. 25. Ice-house floor. 26. Shifting planks. These are rough planks, running fore and aft between the stanchions, to prevent the ballast from shifting to either side in case the vessel should be knocked on her beam ends. 27. Ballast. The kind of ballast usually carried and the method of storage is seen beneath the glass. The ballast extends the entire length of the ice-house. 28. Forward slaughter-house. 29. After slaughter-house. 30. Forward wing-pen, port side. 31. Wing-pen, port side, next to forward one. 32. Third wing-pen, port side. 33. Fourth wing-pen, port side. 34. Wing-pen, port side, next to after one. 35. After wing-pen, port side. This is often filled with salt, which is carried for the double purpose of curing any codfish which may be taken, and also for salting the fishing gear when not in use. 36. After-midship pen. 37. "Hospital" pen. This is the pen amidship which incloses the mainmast and pumps, and is so called because it is difficult to ice halibut properly in it: sometimes called the mainmast pen. 38. Slaughter-house pen. 39. Mainmast. 40. Pumps. 41. Forecastle companion-way. 42. Fore hatch. 43. Main hatch. 44. Quarter-deck break. 45. After hatch. 46. House. 47. Skylight. 48. Funnel-cap. 49. Cabin companion-way. 50. Steps. 51. Locker-seats. 52. Binnacle. 53. Stove. 54. After berth, port side. 55. Forward berth, port side. As a rule, two men sleep in this berth. This is in all respects like the captain's berth, which is directly opposite. 56. Coal-locker. 57. Room for spare gear, &c. 58. Rudder. 59. Rudder-head. 60. Taffrail. 61. Knight-heads. 62. Keel. 63. Keelson. 64. Cutwater. 65. Stem. 66. Stern-post.

IDEAL FISHING SCHOONER NEW ERA.

[Model, scale ½ inch to 1 foot.]

Builder's model, showing starboard side of schooner; mounted in medallion, and rigged with spars, sails, &c., complete. Clipper; long, sharp bow; deep body; more than average "dead rise;" long, clean run; full, elliptical, overhanging stern, slanting upward from the lower center to the corner; fine sheer; long quarter-deck.

Dimensions of full-size vessel.

Hull.—Length over all, 85 feet; keel, 69 feet; beam, 21½ feet; depth of hold, 10 feet; draught, aft, 10½ feet, forward, 8 feet.

Spars.—Bowsprit, outside, 20 feet; foremast, full length, 69 feet; mainmast, 70½ feet; main topmast, 36 feet; main-boom, 58 feet (23 feet outside slings); fore-boom, 25½ feet.

Sail.—Mainsail, luff, 45½ feet; foot, 56 feet; leech, 58½ feet; head, 28 feet. Foresail, luff, 43¾ feet; foot, 24¾ feet; leech, 53 feet; head, 24¾ feet. Jib, luff, 67 feet; leech, 44 feet; foot, 27 feet. Fore staysail, luff, 49 feet; leech, 42 feet; foot, 20½ feet. Main staytail, luff, or forward end, 15 feet: head, 33 feet; leech, 4½ feet; foot, 25 feet. Main gaff-topsail, luff, on topmast, 27 feet; lower hoop to tack, 16 feet; leech, 36¾ feet; foot, 28½ feet.

Gloucester, Mass., 1883. 57,051. Designed by Capt. J. W. Collins, U. S. Fish Commission.

This model represents a schooner of about 90 to 100 tons register, designed especially for the winter fisheries. A vessel built from it would be about 2 feet deeper than the typical American fishing schooner of the same length, and about 1 foot less beam. It would have less difference in draught between the bow and stern, or less "drag-line." The rig differs from that of the ordinary schooner in having a stem staysail and jib, instead of the large jib now commonly used, and also in having shorter lower masts. In summer the rig might be changed by the addition of a foretopmast and jib-boom, with sails to correspond. It is believed that a vessel constructed on such a model would be safer in heavy gales, and much swifter, taking the chances as they come, than schooners of the ordinary type, which have much less body under water. The ballast can, of course, be placed lower, and thereby the leverage increased and the chances of capsizing decreased.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Full, rounding, and flaring bow on top, sharpening rapidly toward the water's edge; long, straight sides; comparatively narrow beam; square stern; low bilge; short floor; long, but rather full run. Dimensions of vessel: Length, 66 feet over all; extreme beam, 18 feet; draught of water aft, 9 feet, 6 inches.

Essex, Mass. Type, 1845 *to* 1860. *U. S. Fish Commission.* 54,405.

This is the model of the schooner Elisha Holmes, of Cape Cod, built at Essex in 1849, to engage in the cod and mackerel fisheries. It is the form of a class of vessels very much in use in the period from 1845 to 1860, and represents one type of the so-called sharp-shooters of that day. During the transition stage from full-bowed to sharp vessels it was the opinion of many experts that it would be unsafe to build a vessel very sharp on the rail. It was thought that with a full rounding bow on top and much flare, a vessel would be prevented from plunging as deep in the water as she otherwise might do. Later developments have shown that this theory is a wrong one, and that a vessel with a flaring bow is not as good as one with straighter top timbers.

SWEDISH COD-FISHING VESSEL, BANKSKUTA.

[Model.]

Wood (outside plank, oak; deck, pine), unpainted; carvel built; flush decked; wide and deep; strong sheer; full, flaring, scoop-shaped bow; great rake to stem; hollow water-lines and floor; stern shaped like bow, full above, much concaved below; straight stern-post; narrow, square-heeled rudder; moderate depth of keel; heavy bow chocks; windlass works with hand-spikes; cabin forward; 4 hatches; 1 pump; 1 large anchor; cable runs over roller in stem; steers with tiller; low, heavy bulwarks. Ketch-rigged, with running bowsprit; 6 sails—jib, stay-foresail, mainsail, sprit mizzen, and 2 square-headed gaff-topsails.

Dimensions.—Length (hull) over all, 42 inches; keel, 28 inches; beam, 17¾ inches; depth, amidships (bottom of keel to top of rail), 8¾ inches; bow (to top of stem), 13½ inches; to top of knight-heads, 12 inches; stern (to top of rail), 12 inches; (post ½ inch higher); keel, 1 inch; dead-wood, above keel, 1¾ inches; bulwark, amidships, ¾ inch; at stem and stern, 2½ inches. Spars, bowsprit, 21 inches; 14½ inches outside of stem; mainmast (deck to eyes of rigging), 31 inches; eyes of rigging to topmast truck, 16¾ inches; maingaff, 16½ inches; mizzen mast (deck to eyes of rigging), 29 inches; rigging to topmast head, 8½ inches; sprit, 22 inches; outrigger, outside, 10½ inches.

Bohuslan, Sweden, 1883. 76,008.

[Obtained by exchange with Swedish Commission to International Fishery Exhibition, London, 1883.]

Vessels of the class represented by this model fish for cod chiefly on the Storregen Bank. They make one voyage yearly, starting in April and returning in September. They hail from the island of Tjorn, on the Bohuslan coast. The peculiar flaring bow is thought to be necessary, by Swedish fishermen, to enable the vessel to ride safely at anchor.

GOTTLAND (SWEDEN) HERRING-FISHING BOAT.

[Model.]

Wood; unpainted; clinker built, 7 strakes a side; 15 sets of timber; open; sharp ends; deep keel; curved stem and stern-post; round bilge; 5 thwarts, 2 with mast-holes; schooner rigged; 2 small, boomless, sprit sails, 2 square-headed sprit top-sails, and 2 jibs; stone killick in wood frame; peculiar wide-loomed oars, with cleats to ship over single round wooden tholes.

Dimensions.—Length over all, 5 feet 5½ inches; keel, 3 feet 6½ inches; beam, 1 foot 5 inches; depth, inside, 6½ inches; keel, 1½ inches; height, amidships, 8½ inches; stem, 12 inches; stern, 11¾ inches; mainmast, 27¾ inches; sprit, 27 inches; topsail pole, 22½ inches (1 foot of this below masthead); topsail sprit, 12½ inches; foremast, 30½ inches; sprit, 28½ inches; topsail pole, 25 inches (13½ inches below masthead); topsail sprit, 15 inches; bowsprit, 28½ inches; oars, 29 inches.

Island of Gottland, Sweden, 1876. 28,149.

[Gift of Swedish Centennial Commission.]

Boats of this class are used in the herring fisheries from the island of Gottland in the Baltic Sea, off the east coast of Sweden. In 1869, the number of boats so employed from that island was officially given at 606, manned by 1,911 persons. The Gottland boats have an excellent reputation for seaworthiness. It is said they are often caught out in heavy gales. The largest of these craft are 25 feet long.

NETHERLANDS LIFE-BOAT.

[Model.]

Oak, with cork bead or half-round band along sides; open iron railing; unpainted. Model divided into two sections, from stem to stern, to show the interior arrangement. This boat has a round bilge; low, flat floor; a wide, very shallow keel; both ends alike, full and round; curved stem and stern-post, both of which are high. Running around both sides, from stem to stern-post, is an open iron railing, four standards of which have row-locks at their upper ends. These rails are about 3 feet high on a full-sized boat, and are for the purpose of preventing the occupants of the boat from being washed overboard. Boat has two decks, between which are snugly packed a large number of air-tight galvanized iron boxes that fill the space between decks. Along the sides of the boat are a number of holes provided with valves through which water enters to fill the section below the lower deck. The boat, when afloat, is supported entirely by the air-tight boxes. Two strong cleats across the upper deck hold the oars.

Dimensions.—Length over all, 19 inches; beam, 6½ inches; height of hull, amidships, 2 inches; ends, 3 inches; stem and stern-post, above gunwales, 1½ inches; iron railing, 1¾ inches; boxes, ¾ inch square; oars, 11¾ inches long.

Holland, 1880. 76,001.

[Gift of A. E. Maas, Scheveningen.]

This form of life-boat was designed by Mr. Maas, who says it has been used with great success in saving shipwrecked crews in the shallow waters off the Netherlands coast. It is claimed that the boat is not capsizable, though this may be questioned. The men stand on the upper deck to row.

Among the desiderata, which it occurs to me as the most needed at the present time, I would mention the following rigged models: (1) A snow of the seventeenth century; (2) the Mayflower; (3) a topsail sloop (a craft much used in fishing and whaling in the early history of the country); (4) Fulton's steamer, the Clermont; (5) old style topsail and top-gallant sail schooner; (6) Hermaphrodite brig; (7) brigantine; (8) square-rigged brig; (9) bark; (10) ship, medium clipper; (11) a Connecticut sloop smack; (12) two-masted coasting schooner, Atlantic coast; (13) three-masted schooner of the Atlantic coast; (14) four-masted schooner of the lakes; (15) a Rockport, Mass., stone sloop; (16) American pilot boat; (17) sloop yacht; (18) schooner yacht; (19) cutter yacht; (20) Louisiana fishing lugger; (21) Cedar Key net-boat; (22) New Jersey surf-boat; (23) transatlantic steamship; (24) Mississippi River steamer; (25) Hudson River steamer; (26) stern-wheel steamer, style used on Western rivers; (27) auxiliary steam whaler; (28) steam yacht; (29) the model of the Viking ship exhumed in Norway; (30) an English North Sea beam-trawler; (31) a Brixham fishing cutter; (32) Scotch herring lugger; (33) an English Mount's Bay lugger; (34) an English well-smack; (35) a French fishing lugger of Boulogne; (36) a British steam-trawler.

The historical models might be supplemented by pictures of (1) polacca-rigged vessel; (2) barkentine; (3) steamer Savannah, which was the first to cross the Atlantic; and (4) a series of illustrations of the earliest attempts to construct steamboats.

HISTORY OF THE COLLECTION.

Previous to the establishment of the National Museum by an act of Congress in 1846, the earliest accessions which now constitute this collection had been gathered by the Wilkes Exploring Expedition, 1838–'42. These consisted chiefly of a few models of the canoes and other water craft used by the natives of the Pacific islands.* From 1842 to 1876 a few models of canoes, &c., were obtained from various sources, but none of them were of especial importance as compared with the more extensive accessions in recent years, and it may be safely asserted that before the Centennial Exhibition the amount of material gathered appertaining to this department was relatively small in amount. The fine collections that were brought together at Philadelphia on the occasion of the Centennial Exhibition in 1876 were almost without exception presented to the Museum. By these generous gifts of foreign Governments and individuals the Museum became the possessor of a rich collection both of domestic and foreign water craft. Among other things derived from this source and which are deserving of special mention, is that of a large dugout war canoe, 59 feet in length, from British Columbia, which now forms a prominent feature of this department. Large collections of boats were also obtained from Norway, Sweden, China, and Siam, which are of great value and especially interesting to the student of naval architecture.

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*It is to be regretted that most, in fact nearly all, of these models, owing to lack of care and perhaps to the fact that they were moved about considerably before becoming the property of the National Museum, are very much out of repair, and in some instances have been injured to such an extent as to practically render them worthless.

On the occasion of the participation of the U. S. Fish Commission in the International Fisheries Exhibition held at Berlin in 1880, the collection was much enlarged by the addition of numerous forms of American fishing craft, sporting and hunting boats, &c.; while by exchange and purchase at the close of the exhibition several very desirable acquisitions were obtained, principally of German and Dutch fishing craft. The act of Congress authorizing the participation of the U. S. Fish Commission in the International Fisheries Exhibition at London, in 1883, enabled us to make other additions to our collection representing the fishing flotilla of the United States, which, as has elsewhere been stated, now comprises representatives of nearly all the more important types of water craft engaged in this special industry. In the mean time Mr. James G. Swan, assistant U. S. Fish Commission, who has been stationed at Port Townsend, Washington Territory, has been indefatigable in getting together a vast deal of interesting and valuable material which represents the different forms of canoes, dugouts, and other boats used by the Indians of the northwest coast.

We have already stated that the collection has been much enriched by donations from foreign nations and individuals who participated in the London Fisheries Exhibition, as well as by citizens of our own country.

I (F).—REPORT UPON THE SECTION OF FOODS OF THE U. S. NATIONAL MUSEUM, 1884.

By ROMYN HITCHCOCK, *Acting Curator.*

The collection of foods, drinks, narcotics, etc., which has been placed temporarily under my charge, has received during the year some valuable additions, but it has been impossible to devote much time to arranging or labeling the specimens; the labor required to prepare the collection of textiles for the New Orleans Exposition having greatly interfered with the regular work in this department. Such specimens as have been received, however, have been properly cared for, and in most instances placed in the cases with temporary labels attached.

IMPORTANT ADDITIONS.

Thirty-three specimens of foods, spices, and fruits of various countries from the Royal Botanical Gardens, Kew, England.

Thirteen specimens, including starches, jellies, grains, and fruits, from the Goverment of Hawaii, received through the Boston Foreign Exposition.

A series of seventeen specimens of Cheshire salt, from Cheshire, England, presented by Mr. J. J. Higgin, of Liverpool, England.

Seventy-six specimens of food from Guatemala, including coffees in great variety, cacao beans, starches, flours, annato, tamarinds, and various other articles, received through the Boston Foreign Exposition.

Nine specimens of foods from Brazil, including coffees, maté, sugar, banana paste, araca paste, etc., received through the Boston Foreign Exposition.

Fifty-two specimens from San Salvador, including seven specimens of cigars, ten of leaf tobacco, ten of coffee, with varieties of honey, corn, rice, beans, and various other products, received through the Boston Foreign Exposition.

Seventy-nine specimens of canned goods, pickles, sauces, and manufactured articles of various kinds, from Messrs. Crosse & Blackwell, London.

Thirty-one specimens of foods of various kinds, collected for the Museum by Mr. V. P. Parkhurst, in Jamaica.

Thirteen specimens of the "dalls" of various qualities used in India, from Rev. C. H. A. Dall.

ROUTINE WORK.

The collection of foods of the North American Indians, which is large and of great interest, has been arranged in order, but many duplicate specimens are in the cases, which must be removed when there is opportunity for studying the collection. These foods being principally vegetable products, which are for the most part used without preparation other than roasting or boiling, it has seemed advisable to arrange them according to their botanical relations.

The other specimens of food are partly arranged in the cases according to the system proposed by the Assistant Director, and published in Volume IV of the "Proceedings," appendix.

PRESENT STATE OF COLLECTION.

There are now on exhibition—

Indian foods	349
Other foods, narcotics, drinks, &c	1,231
Total	1,580

A large number of duplicate specimens is reserved for exchanges, but the number is not known.

RECOMMENDATIONS AND REMARKS.

The collection of foods can be made of far greater interest than one who has given no consideration to the subject would suppose. It is not intended to be merely one set of specimens in bottles to show what people eat, but it should be made to indicate the dietetic value of foods of various kinds, to represent the best knowledge concerning the nutritive value and digestibility of various foods, resulting from physiological and chemical investigations. Not only should it indicate the value of a food, but it should also explain to what peculiar qualities or constituents its value is due, and what combinations of foods are necessary to the maintenance of health and strength. At present the collection possesses very little scientific value; but it is hoped that in the course of another year there may be a great change in this respect. Already Prof. W. O. Atwater, whose analyses of various articles of food are well known to chemists, has contributed some valuable results of his labors, in the form of specimens for exhibition, to illustrate the composition of the human body. These will soon be displayed, and thus a beginning made toward making a collection which shall be of great educational interest and value. The progress that can be made in this work must, however, depend very much upon the assistance which the acting curator receives to carry on the regular museum work.

II.—REPORT OF THE DEPARTMENT OF ETHNOLOGY OF THE U. S. NATIONAL MUSEUM FOR 1884.

By OTIS T. MASON, *Curator.*

The duties of curator of the Department of Ethnology in the National Museum were assumed on the first day of July, 1884. My first work was to gather from the various rooms of the Smithsonian Institution, from the Armory, and from the National Museum, every specimen of anthropological material not already cared for by the curator of Antiquities, the curator of Civilized Arts and Industries, and the honorary curator of Keramics. These objects I have arranged in drawers according to certain classific concepts, not necessarily the same as those used in the Museum, the intention being to facilitate ready reference and comparative study. The advantage of this method is readily seen in the fact that every ethnologic specimen can be found at once by my assistants, that those things which are suggestive of the progress of each art lie side by side, and that specimens badly defined or without labels have easy explanation by means of their nearest neighbors. One fact is revealed by this plan of temporary storage. It is that the former methods of collecting material should now be replaced by a still more exhaustive and scientific method. Every specimen now in the collection is valuable and will find a place in future installation; many also have the great merit of being old and well authenticated; but, owing to the youth of ethnologic science, hardly any efforts have been made to exhaust a single art to represent its life-history in its entirety. The comparative anatomist hopes by means of well-dissected specimens of present animal life to reconstruct from a bone or two some extinct form. What would be the chances of success for him, however, if he had but a few fragments of the modern animal? Is not the attempt to reconstruct the society of primeval man by means of desultory collections from the modern savages quite as futile? Now, with the permission of the Director and Assistant Director of the Museum, I should like to introduce a still more rigorous policy in this regard, recommending, first, that all collectors shall be instructed to observe faithfully all of the elements of each art, and to omit nothing, however cheap or trivial, that illuminates it; secondly, that the friends of the Museum who have gratuitously contributed to its success, and who will continue to do so, be advised of our wishes in this matter. Doubtless material of questionable reference will continue to flow in, but under the secure guidance of things wisely selected even rubbish, well authenticated, will become useful. In carrying out this view I would recommend the preparation of a short and explicit guide-book on this subject. I would also most earnestly request that contributors to our collections be impressed with the necessity of sending their specimens which are subject to destruction by moths, breakage, or weather promptly to the Museum, and to give as much attention to preservation as to collection. It is a lamentable fact that a very large number of the objects received during my short term have been rendered comparatively worthless by a neglect of this precaution. I cannot think of a greater disaster in museum work than that in which the gatherings of a lifetime frequently are sacrificed in a few short weeks. If contributors cannot comply with this request at once, they should soak the specimens in benzine to kill any vermin already concealed, and with a fine brush go over the parts in danger with a solution of arsenic and alcohol, or corrosive sublimate in alcohol, drying in the shade.

Among the ends which the curator of the Department of Ethnology is very anxious to accomplish, and toward which he begs the co-operation of his scientific brethren, no one seems to be more important than a correct nomenclature of the different classes of objects with which he has to deal. On the one hand an utter disregard of nomenclature is so vicious that no argument need be urged against it. On the other hand there is a danger of overloading the subject with too many difficult names, tending rather to confusion than to perspicuity. The following rules, found to be of the greatest service to anthropo-biologists, will certainly meet with favor from all comparative technologists:

First. Every class or species of objects, and every distinct part of each object, should have a name.

Second. Each class or part should have but one distinctive name, although synonyms well understood may be allowed.

Third. Distinctive names should apply to only one class of objects or parts.

Fourth. Names in good use, if distinctive, should always have preference.

Fifth. If a class of objects is confined to a definite locality, then the name used for that class in that region should be adopted, *e. g.*, kyak, babbiche, tepee, &c. If necessary, Latin and Greek compounds may be used when no other modern appellation can be found.

ACCESSIONS OF THE YEAR.

It is contemplated to prepare, with copious illustrations, a classified report of all the ethnological materials in the Museum, according to those concepts or categories that are in use among ethnologists, such as function, tribe, geographical distribution, degree of elaboration, material, classes of investigators, &c. For the present, in order to show in as profitable manner as possible the true value of the year's collection, and also to bring before the mind of the Director the great gaps that have been left, a beginning is here made of the kind of report hinted at above.

The geographical concept is here made prominent, because it brings us into immediate relations with the collectors. Following this, classes of objects, with their functions, receive attention, especial care being taken to distinguish the relation of form, &c., to tribe, environment, and material.

ESKIMO OF GREENLAND.

Disco Island.—Plate of whale's vertebra and bone implement found on Disco Island by the Greely Relief Expedition. 5 pieces.

Holsteinberg.—A kyak with accouterments complete, consisting of the typical Greenland skin kyak, line-rack, harpoon, harpoon-line, and throwing stick (the latter having two perforations to fit in ivory hooks in the shafts of the harpoon), seal-skin float, double paddle strengthened with plates of ivory, short lance, halibut lance, fair-weather jacket—which is simply a broad cincture of dressed seal-skin fastened around the hole at the top of the kyak and under the arm-pits of the navigator, to keep the spray from entering the boat, and water-proof jacket of seal-skin worn during rough weather.

ESKIMO OF POINT BARROW.

One of the most valuable collections in the National Museum is that which was deposited during the last year by Lieut. P. H. Ray. Inasmuch as an exhaustive report of this collection is now being prepared by Mr. John Murdock, only a brief mention of the various classes of objects will be made here.

Adzes with stone and iron blades	21
Boat models and parts of boats	9
Wooden boxes and skin bags with carved ivory handles, for tackle and implements.	17
Ivory box handles	25
Stone and ivory carvings	60
Charms used to give success in hunting	18
Combs for straightening the hair on deer-skin	7
Toilet combs	3
Food trays, cooking pots, &c	28
Bone daggers	2
Dolls, and other amusements for children	12
Articles of dress	38
Implements and weapons connected with hunting and fishing	168
Harpoons—one of which Mr. Murdock calls a "retrieving harpoon," consisting of an ice-pick, shaft, fore-shaft, loose shaft, and point, all fastened together. The line is held in the hand when the whole weapon is launched.	
Mr. Murdock distinguishes three types of the lance—the slender deer lance, the medium bear lance, and the broad, clumsy whale lance—none of them barbed.	
Musical instruments, drums and whistles	11
Stone lamps	6

Masks		10
Knives (including chipped flints, slate knives, ivory-carver's knives, &c.) and knife sharpeners		117
Tools for working in ice and snow, mattocks, picks, &c		10
Pipes		9
Snow shoes	pairs..	3
Snow goggles		4
Needle cases, and sewing and netting needles		40
Sled models		2
Perforators and fire drills		45
Mechanical tools (hammers, flint chippers, scrapers, &c.)		29

COLLECTIONS FROM OTHER SOURCES.

Chukchis or Eskimo of Northeastern Siberia: Vega Expedition.

Leather bag containing flint and tinder; bag made of braided fiber; portion of a quiver; skewer for stopping the flow of blood from a wounded animal; two images—bear and seal—worn as pendants; these flat-bottomed carvings, according to Dr. Franz Boas, are also used in playing a game. A number of them are held in the hand and dropped on a flat surface. Those that fall upright, count. These two objects are carved in ivory. Hoe made of a scapula, lashed to the flat end of a pine handle, with deer-skin babbiche. For this purpose six perforations are made in the scapula, and three in the handle.

Diomede Island: E. W. Nelson.

Bird spear	1

Norton Sound: E. W. Nelson.

Boat paddles	2
Bows	3
Fish-gig, like Neptune's trident, central point short and not barbed, outer prongs elastic, barbs introrse and triangular	1
Labret	1
Seal spears	2

Bristol Bay: C. L. McKay.

Spear points		2
Ivory flukes of boat-hooks		2
Fish-hook		1
Seal-bladder buoy		1
Ivory powder charges		2
Dolls		4
Bone and ivory labrets		10
Wooden vessel		1
Hooks used in the house for suspending food, &c		1
Ivory leather-creaser		1
Wooden finger-rings		2
Bead ornaments		2
Carved bodkins		3
Thimbles		2
Mittens	pair..	1
Belt toggle		1
Carvings		15
Pouches for tackle and fishing implements		6
Knife blades and sharpeners		12

Bristol Bay: William J. Fisher.

Wooden handle of tool-bag		1
Stone lamp		1
Spears and spear heads		7
Throwing-stick		1
Spoons (horn, bone, and wood)		5
Beluga line for great harpoon		1
Skin parka		1
Caps		5

Kodiak: William J. Fisher.

Native almanacs		2
Circular pieces of pine wood with twelve lines radiating from the center to represent the months. On the two sides of each line very small holes are placed, opposite each other, representing the days. Small circles in red paint stand opposite some of these holes for purposes not mentioned by the collector.		
Woman's work-bags		2
Games		2
Stone implements, knives, picks, &c		11
Stone mortars		2
Fenders for kyak		2
Stone lamps		11
Labret		1
Ancient masks		2
Grass mittens	pairs	2
Fish-skin moccasins	pair	1
Dance rattles		2
Whale spears		5
Stone spear-heads		5
Horn spoons		4

Kenais, Cook's Inlet: William J. Fisher.

Copper ax		1
Ammunition belt		1
Model of bidarka		1
Cap		1
Stone lamp		1
Grass mat		1
Shaman's rattle		1
Snow shoes	pair	1

Katmais, Kodiak: William J. Fisher.

Wooden basket		1
Bow		1
Cap		1
Celts		2
Kelp line and hook		1
Hunting hat		1
Wooden ladle		1
Whalebone mortar		1
Parka		1
Snow shoes	pair	1

Indians, Upper Yukon River: J. G. Swan.

Parts of a trap.

Thlinkets, Sitka, Alaska: T. Dix Bolles.

The specimens in this collection were found in very ancient graves.

Pipe		1
Wooden masks		21
Carved wooden rattles		9
War clubs		2
Bone charms		10
Ivory fluke of boat-hook		1
Wood carvings		7
Dance wands		2
Parts of head-dress		2
Head-dresses		6
Necklaces		3
Shaman's basket of charms	pieces..	6
Grass hat		1
Fringed leather sash		1
Articles of dress, leather		6
Breast armor		1
Wooden clappers		3

(Two disks of wood with handles; one of the handles is rigid, the other flexible; the two are lashed together. When the clappers are shaken, the piece with the flexible handle moves up and down and strikes against the other, making a rattling noise like a castanet.)

Takoos: J. G. Swan.

Carved wooden dishes		4

Graham Island: J. G. Swan.

Peccary tusk, obtained by barter		1

Massetts and Skidegates: J. G. Swan.

Stone adzes		2
Basket		1
Carved boxes, of wood		7
Slate boxes, carved		5
Yew work-box		1
Models of canoe		2
Canoe bailer		1
Carved canes		29
Dancing figures, copper		5
Wood and stone carvings		5
Slate for carving	piece..	1
Copper bow and arrow, ceremonial	pieces..	2
Emblems of rank, chief's staves		4
Chief's bow and arrow	pieces..	2
Doctor's staves		4
Doctor's charms		23
Copper dagger		1
Embroidered belts		2
Cloth leggings	pair..	1
Ear ornaments	pairs..	52
Dance dress	pieces..	13
Nose ornament		1
Beaver's teeth	string..	1
Necklaces		2
Drum		1
Copper ornament		1
Food dishes		26
Seal club		1

Massetts and Skidegates: **J. G. Swan—Continued.**

Halibut hooks	4
Fish hooks	4
Hunting pouch	1
Fish net	1
Kelp line	1
Fish line	1
Gambling sticks	sets 2
Pipe, black slate	1
Hats	25
Head-dresses	6
Model of house	1
Embroidered knife sheath	1
Knives	5
Masks	15
Mortars (stone)	7
Mauls	3
Pestle	1
Pipes	3
Paint pouches	5
Tattooing needles and paint, &c.	12
Pouch	1
Stone plates	4
Dance rattles	15
Seal-spear points	6
Horn spoons	25
Totems	22
Deer ribs for leather-working	24
Stone tool	1
Dance whistles	36
Roll of birch bark	1
Buckets	2

Bella Coulas: J. G. Swan.

Wooden masks	8
Carved images	2
Totem posts	2

Makas: J. G. Swan.

Baskets for tackle, &c. (cedar bark)	4
Bottles covered with basket-work	2
3 bows and 6 arrows (yew)	9
Quiver, 4 yew bows, 14 cedar arrows	19
Blubber trough	1
Boat paddles	4
Dug-out canoe (complete)	1
Canoe bailer	1
Model of whaling canoe (complete)	1
Fish club	1
Wooden carvings	3
Kelp lines	11
Fish hooks	20
Whale harpoons	4
Small harpoons	2
Harpoon points	4
Spear shaft	1
Seal spear-heads	2
Rag mat, or rug, woven like basket	1

Taos: F. H. Cushing.		
Fetich		1
Zuñis, New Mexico: Col. James Stevenson.		
Fetiches		108
Weaving stick		1
Navajo Indians, New Mexico: F. H. Cushing.		
Fetiches		2
Navajoes, New Mexico: V. Mendeliff.		
Silver jewelry (native work)	pieces..	22
Mokis, Arizona: Col. James Stevenson.		
Fetiches		5
Apaches, Arizona: B. A. Clemmer.		
Necklace of finger-tips		1
Apaches: Dr. W. T. Parker.		
Bed		1
Arapahoes, Idaho Territory: F. E. Wilcox.		
Saddle bags	pair..	1
Assinaboines, Dakota: F. H. Cushing.		
Moccasins	pair..	1
Kiowas, Dakota: D. B. Wilson, U. S. A.		
Shield		1
Sioux, Dakota: F. Riggs.		
Head-dress		1
Sioux, Dakota: A. Gecks.		
Medicine man's pipe		1
Rees, Dakota: F. G. Walters, U. S. A.		
Hoe, made of shoulder-blade		1
Blackfeets, Montana: P. R. Brown.		
Reed mat		1
Wooden bowl		1
Chippewas, St. Ste. Marie: J. H. T. King.		
Grave deposits	pieces..	12
Poncas, Nebraska: G. N. Hopkins.		
Ax from a grave		1
Winnebagoes: J. D. Middleton.		
Medicine man's club		1
Mohawks, New York: W. H. Holmes.		
Wampum belt		1
Florida frontier: Dr. E. Palmer.		
Mosquito brush		1
Pipe		1
Sticks used as toothbrushes	bundle..	1
Nicker seed, used as marbles by the boys	bag..	1
Florida: J. Bell.		
Slippers made of rattlesnake skin	pair..	1
Antiquities from Ancon, Peru: Collected by George W. Kiefer, and Dr. W. H. Jones, U. S. N.		
Reed work-basket		1
Wooden needles		6
Spindle whorls		5
Silver pins		6

Antiquities from Ancon, Peru: Collected by George W. Kiefer, and Dr. W. H. Jones, U. S. N.—Continued.

Wooden combs	2
Copper breastpin	2
Stone gorget, crescent	1
Poncho	1
Gourd plates	2
Ears of corn	7
Gourd containing beans	1
Gourd containing cotton	1
Gourd containing peanuts	1
Gourd vessel	1
Small lime pouch	1
Corn-cob head-dress	1
Fish net	1
False heads	9
Silver gourds	2
Mummied sheep legs	2
Work-baskets	2
Mummied man	1
Mummied woman	1
Mummied child	1
Mummied head and arm	2
Bone tablet	1
Stone pendant	1
Small ball of brown yarn	1
Gold ear ornaments	6
Bead necklace	1
Copper bracelets	2
Shell ornaments	2
Lime box	1
Balls of paint	2
Gourd jar	1
Weaving reeds	3
Wood carving	1
Weft sticks	15
Emblems (flags)	2
Reed bobbins	55
Gourd containing feathers and skull of a parrot, and mummied Guinea pig	1
Mummied dog, and parts of another	2
Stone ball	1
Work-basket, reeds	1
Saddle-bags .... pair	1
Drinking gourds	2
Corn-husker	1
Specimens of Inca cloth	38
Rope	1
Gold necklace	1
Silver gorget	1
Silver vases	2
Cloth bag	1
Head-dress	1
Side bags	11
Sling	1
Reed flute	1
Musical cradles	2

Antiquities from Ancon, Peru: Collected by George W. Kiefer, and Dr. W. H. Jones, U. S. N.—Continued.		
Reeds, or bobbins		25
Lance		1
Spindle		1
Silver bracelets		2
Nicaragua: Dr. E. Flint.		
Bark shirt		1
British Guiana: C. Heape.		
War club		1
Popayan, U. S. Colombia: D. J. Benner.		
Palm leaf coat		1
Guaymas, U. S. Colombia: J. H. McNiel.		
Bows		8
Spears		15
Brazil: Museum für Völkerkunde.		
Bow and five arrows		6
Throwing-spears		7
Tate Yama, Japan: P. L. Jouy.		
Snow-creepers	pair..	1
Powder-flask		1
Straw shoes	pair..	1
Hunters' knives		2
Leggings	pair..	1
Shoe and glove made of antelope skin		2
Yokohama: P. L. Jouy.		
Baskets		2
Omatchi: P. L. Jouy.		
Shrine offerings		4
Nikko: P. L. Jouy.		
Shoes	pairs..	2
Antelope skin coat		1
Shrine offerings		3
Shoes and stockings	pair of each..	1
Pieces of pottery		11
Kurile Islands: A. J. M. Smith.		
Puffin skin coat		1
Bengal, India: International Fisheries Exhibition.		
Pipe		1
Nineveh: O. T. Mason.		
Deluge tablet		1
Ningpo, China: P. L. Jouy.		
Joss-stick powder.		
Formosa, China: Gift of Royal Botanical Gardens, Kew.		
Rain-coat of coir fiber		7
Mangata: Charles Heape.		
Stone-headed adze		1
Asia Minor: Carnaduas.		
Ancient lamps		9
Ova Herero, Africa: Gift of Museum für Völkerkunde.		
Bow		1
Arrows . .		4
Ebony c		1

Gallas: Museum für Völkerkunde.		
Iron-pointed arrow		1
Nubia: Museum für Völkerkunde.		
Club		1
Mandingo: Museum für Völkerkunde.		
Iron-pointed arrows		2
Ova Mbo: Museum für Völkerkunde.		
Wooden collars		2
Iron-pointed arrows		2
Kaffirs: Museum für Völkerkunde.		
Gourd snuff-box		1
Africa: C. Heape.		
Arrows		8
Africa: Gift of Royal Museum of Sweden.		
Whips of rhinoceros hide		2
West Africa: Dr. Chatard.		
Quiver, bow, 12 arrows		14
Spear		1
Belt, dagger, and sheath		3
Polynesia: Museum für Völkerkunde.		
White tapa cloth	specimen	1
Maoris, New Zealand: Mrs. M. A. Piper.		
Belt made of seed		1
Miniature Bible made of gum		1
Fiji: C. Heape.		
War clubs		5
Arrows		5
Solomon Islands: Museum für Völkerkunde.		
Clubs		3
New Caledonia: C. Heape.		
Club		1
Papuans, New Guinea: A. P. Goodwin.		
Wooden shields		2
Arrows		53
Bamboo bows		2
Sword-club		1
Paddles		4
Spears		30
Feather necklace		1
Seed necklace		1
Carved staff		1
Carved image		1
Feather plume		1
Seed bracelets		2
Nose-pegs		5
Fiber and cord	specimens	2
Money—79 very small rings on a stick		1
Jew's harp		1
Finger ring		1
Shell gorget		1
Shell necklaces (*Oliva carniola*)		2
Seed ear-rings		4
Canoe model		1

Papuans, New Guinea: A. P. Goodwin—Continued.

Bird beak head-dress	1
Baskets	2
Cinctures—palm-leaf fiber	4
Wood carvings	4
Net bag	1
Lime boxes for betel-nut chewers	7
Lime spoons, wood and bone	12
Wooden hat	1
Cuttlefish-shell spoons	8
Bamboo tube of native glue	1
Cuttlefish-shell gorgets	1
Shell armlets and bracelets	8
Bamboo flute	1
Fish net	1

In some of the entries given above, the numbers include several specimens. Omitting pottery, antiquities, examples of textiles, fishing, and navigation, the number of purely ethnological specimens received during the year will amount to not far from four thousand.

II (A).—REPORT UPON THE SECTION OF AMERICAN ABORIGINAL POTTERY OF THE U. S. NATIONAL MUSEUM FOR 1884.

By WILLIAM H. HOLMES, *Honorary Curator.*

The greater part of the collection of aboriginal American pottery has been placed in the northwest court of the Museum. A preliminary classification has been made, and as soon as the necessary cases are completed a representative series will be placed on exhibition.

The wall cases have been finished and are now occupied, chiefly, by the very extensive collection of modern pueblo ware. The arrangement is only temporary, however, as the final placing will not be attempted until the more recent additions are catalogued. During the year a large case has been constructed for the center of the hall, and plans have been made for a number of smaller cases for the floor.

The year is remarkable for the great number of additions to the collection, upwards of ten thousand earthen vessels having been acquired and entered upon the books. These have been obtained through purchase, exchange, and donation, as well as through the various agents of the Museum.

The Bureau of Ethnology has contributed upwards of six thousand pieces. These comprise the collections of James Stevenson from the modern pueblos; of Victor Mindeleff, E. H. Nelson, and H. C. Yarrow, from the ancient ruins of New Mexico, Arizona, and Utah, and of Dr. Cyrus Thomas, from the valley of the Mississippi.

A small collection of interesting fragments from the shell mounds of Maryland was donated by Mr. J. D. McGuire, and a number of fugitive pieces have come from various Southern States. An addition to the Mexican collection, consisting of about one hundred pieces, mostly in a fragmentary state, has been acquired, by donation, from the writer.

Perhaps the most unique and important acquisition of the year is that of some three thousand vases from the ancient tombs of Chiriqui, State of Colombia. This collection was secured from J. C. McNeil, the collector. An extremely valuable collection from Ancon, Peru, has been secured through the agency of Dr. Wliam H. Jones.

In cataloguing and arranging the collection the curator has been assisted by Mr. Henry Walther and Mr. William H. Barbour. The ordinary entry in the records is generally supplemented by a drawing of the specimen. As many of the vases reach the Museum in a fragmentary state, it is found desirable to have them carefully restored. In this work Mr. Walther is extremely skillful. Care is taken that such restorations do not, in any way, falsify the original characters of the vessel.

The curator has been engaged during the year in the study of portions of the collection, first, for the purpose of securing the best possible classification of the material for Museum purposes, and second, with the view of publishing a monograph upon the aboriginal pottery of America. One paper has been prepared on the "Pottery of the Ancient Pueblos," and another upon the "Ancient Ware of the Middle Missisippi Valley." They are supplemented by a third paper upon the "Origin of form and ornament in the Ceramic Art." These papers will appear in the Fourth Annual Report of the Bureau of Ethnology. In addition, a short study of the ceramic products of a section exposed in the city of Mexico has been made. This will appear in the proceedings of the Anthropological Society of Washington.

It will be seen that the collection, already an extremely valuable one, promises in the near future to be worthy of a national museum, but there are many gaps that must be filled up before it can be considered satisfactory to students of American archæology. The collections from all parts of Mexico and the northern Central American states need especial attention. In South American material we are still far behind the museums of Europe.

III.—REPORT UPON THE DEPARTMENT OF ANTIQUITIES IN THE U. S. NATIONAL MUSEUM FOR 1884.

By CHARLES RAU, *Curator.*

IMPORTANT ACCESSIONS.

John J. McLean, Cape Mendocino, Humboldt County, California.—Collection from shell-heaps near Cape Mendocino: Stone chips and flakes, rude and leaf-shaped implements, scrapers, rude arrow-heads, shells of different species (all determined), plates of *Cryptochiton Stelleri* and of *Chiton* (species undetermined), echinus-shell, and teeth of canine animals.

R. E. C. Stearns, United States National Museum.—Collections received at different times during the year: Mortars and pestles from Placer County, California; 9 species of shells from shell-heaps at Rocky Point and Fort Brooke, Tampa Bay, and from Way Keys (one of the Cedar Keys group of islands), Florida; 8 casts of a stone pestle (metamorphic sandstone), found on Santa Cruz Island, California; 8 casts of a stone pestle found at an elevation of 1,500 feet, near Point Sal, Santa Barbara County, California, and 7 casts of a serpentine sinker, found on the university grounds at Berkeley, Alameda County, California; flakes, rude and leaf-shaped implements, scrapers, cutters, and arrow-heads, all of obsidian, also pestles, mortars, and fruit-crushers, from Howell Mountain, Napa County, California; cast of a carved ceremonial weapon, original found at Saint Helen, Columbia County, Oregon; cast of a stone dish with handle, found deeply imbedded in auriferous gravel near Oregon Bar, North Fork of American River, Placer County, California, and casts of 2 clay images found in Aztec graves, while constructing water-works at Medellin, Vera Cruz, Mexico.

W. W. Evans, New Rochelle, Westchester County, New York.—Small collection of stone arrow-heads, bone, copper, and shell fish-hooks, a worked belemnite (?), and a stone bead from Chili, South America.

J. E. Gere, Riceville, Washington County, Wisconsin.—Collection of stone scrapers, cutting-tools, arrow and spear heads, celts, &c., from the vicinity of Riceville.

Lieut. G. M. Wheeler, United States Geographical Surveys.—Specimens collected by Dr. H. C. Yarrow, Dr. J. T. Rothrock, and Mr. H. W. Henshaw in June and July, 1875, from graves at Dos Pueblos and La Patera, Santa Barbara County, California: Chips and flakes, rude chipped implements, arrow and spear-heads (the latter very fine), scrapers, pestles, grinding-stones, mortars, vessels, baking-stones, tubes, pipes (plain and ornamented), beads and other ornaments of stone, *Haliotis*-shells showing use as utensils (one very large), shell beads, discs (pierced), fish-hooks and ornaments, a copper bead and glass and enamel beads of European manufacture, remains of matting and bags, soap-root brushes with handles of asphaltum, handles made of asphaltum and ornamented with shells, red paint cut in various shapes, an iron axe, and several knife-blades, brass bell-tongues, china cups and a saucer.

Army Medical Museum, Washington, D. C.—Collection embracing grooved stone mauls and axes, a celt, rubbing-stones, a metate (Navajo), an arrow-shaft grinder, a small stone mortar, shell beads, and several bone implements from Arizona and Dakota Territories; also a fine bird-shaped object of stone from Sackett's Harbor, New York.

P. L. Jouy, Yokohama, Japan.—Collection of rude chipped implements and fragments of polished celts from Yokohama, rude chipped implements found 20 miles from Tokio, and fragments of bones and shells from the shell-heaps at Omori.

Dr. G. B. Lartigue, Blackville, Barnwell County, South Carolina.—A pierced ceremonial object (very fine), found near Blackville.

Dr. C. A. White, United States National Museum, and Dr. J. A. White, Oregon City, Oregon.—A collection of 601 small arrow-heads of chalcedony, jasper, obsidian, &c., from two points on the east bank of the Willamette River; one a mile above and the other a mile below Oregon City. They were exposed by the washing and caving of the river-bank.

Dr. W. W. Oglesby, Fossil, Wasco County, Oregon.—A very fine sword-shaped stone club, found imbedded in the roots of a fir-tree (supposed to be 300 years old), near Mary's Park, Wasco County.

A. Fairhurst, Lexington, Kentucky.—Collection from the vicinity of Lexington: Rude and leaf-shaped implements, cutting-tools, perforators, arrow and spear-heads, a very fine celt of greenish jasper (chipped and polished), polished celts, a celt-gouge of syenite (the best object of this class thus far acquired), a hematite muller, a discoidal stone, a ceremonial object (partly drilled), and a pipe.

Prof. S. F. Baird.—Collection from shell-heaps on the Bay of Fundy: Chips and flakes of flint, quartzite, lydite, &c., rude arrow-heads, fragments of pottery, vertebræ and spines of fishes, bones of birds, bones and teeth of the seal, beaver, deer, caribou, moose, mink, otter, black bear, and dog; bones split for the extraction of the marrow, and shells (3 species, determined), of which the heaps are composed. This collection is referred to in "Proceedings of the United States National Museum," vol. 4, p. 292.

B. F. Koons, Mansfield, Tolland County, Connecticut.—Square slab of granite with mortar-cavity, cut from rock *in situ*, near Mansfield. A very interesting piece.

W. M. Clark, Nashville, Tennessee.—Collection from different localities in Tennessee: Rude chipped implements, leaf-shaped implements (one of obsidian, very fine), scrapers, arrow and spear-heads, chipped celt-gouge with polished cutting edge, large chipped digging tools, pitted stones, a grinding-stone (a good specimen), polished celts, grooved axes, pestles, a cylindrical crushing-implement, a hematite sinker, pierced tablets, carved stone pipes (some very good), a clay pipe, fragments of large shells (***Buscycon perversum***), shell beads, encrinites, clay vessels (3 of them entire), fragments of pottery, and 3 human skulls, with fragments of jaws.

R. R. Smith, Tulip, Dallas County, Arkansas.—Twelve arrow-heads of exquisite workmanship, from Dallas County, and a collection of leaf-shaped implements, cutting-tools, scrapers, perforators, arrow and spear-heads, and celts from the vicinity of Tulip Creek, 3 miles west of Tulip. The specimens are surface-finds, and the place where they were found was once a large camping-ground.

C. M. Smith, New Madison, Darke County, Ohio.—Collection from Flint Ridge, Licking County, Ohio: Hammer-stones of flint, granite, quartzite, &c, flint cores, flakes, rude and leaf-shaped implements, scrapers, cutting-tools, and arrow-heads. The cores and flakes are exceptionally fine.

Dr. E. H. Davis, New York, N.Y.—Collection of plaster molds for reproducing the mound-pipes collected by Messrs. Squier and Davis during their Ohio survey, and various other archæological objects belonging to the Davis collection now in the Blackmore Museum at Salisbury, England. The molds are a valuable acquisition, as complete sets of casts of the pipes, &c., can now be made.

Robert Ridgway, United States National Museum.—Two arrow-heads from Monteur's Pond, 10 miles east of Vincennes, Indiana. In these arrow-heads the edges are beveled on opposite sides. They are perhaps the best specimens of the kind in the collection.

Statement of character of routine work in arranging and classifying the collections, and preparing the exhibition and study series.

The arranging, classifying, and preparing for exhibition of the collections received has been continued in accordance with the plan indicated in my annual report for 1883. Practically there are but three classes or series of specimens entered in this department: 1. Exhibition and study series, which embraces all *good* specimens. 2. Duplicates, utilized for exchange. 3. Storage, broken stone specimens, and other fragments of no value whatever.

List of special collections which have been placed on exhibition during the year.

Collection from Alaska: C. L. McKay.

Collection from shell heaps, Cape Mendocino, Humboldt County, California: John J. McLean.

IV.—REPORT UPON THE DEPARTMENT OF MAMMALS OF THE U. S. NATIONAL MUSEUM FOR 1884.

By FREDERICK W. TRUE, *Curator.*

IMPORTANT ADDITIONS DURING THE YEAR 1884.

In number, variety, and importance, the accessions of the past year have been fully equal to those of earlier periods. A few specimens of species previously unknown to science were received, but the chief gain has been in species new to the collections, specimens representing new variations of species acquired in the past years, or serving to extend our knowledge of their geographical range, and specimens suitable to replace those which have become faded and otherwise unsightly through long service in the exhibition halls.

In enlarging the exhibition series, much aid has been received from the proprietors of zoological gardens and menageries and from dealers in live animals. The number of species received from these sources during the year was 38, including several rare and peculiar forms. Not less assistance has been received from the Signal Bureau, the U. S. Life-Saving and Light-House Services, the U. S. Fish Commission, and other bureaus of the Government, the *attachés* of which are more or less engaged in field-work. The negotiations of the American commissioner to the London Fisheries Exhibition and of the curator of the department with the authorities of certain European museums have led to the revival of the system of exchanges, which has always proved beneficial.

In addition, collections of greater or less magnitude have been received from about fifty private individuals and corporations. The specimens purchased for the New Orleans Exhibition may properly be mentioned in this connection, as they will eventually be incorporated in the collections of the department. (For complete list of accessions see page 138.)

TERRESTRIAL MAMMALS.

United States.—Two new species, each representing a new genus, have been added to the mammalian fauna of the United States during the year. The first of these, a muskrat-like form, was described by the curator under the name of *Neofiber Alleni*,* from a single specimen collected by William Wittfeld, Esq., at Georgiana, Fla. The second new species, a shrew, was described by Dr. Merriam under the name *Atophyrax Bendirei* †. The type of this species is not in the Museum. Another apparent addition to the fauna is the Brazlian bat, known as *Vespertilio arsinoë*, a specimen of which was sent to the Museum from Banner, Kans., by Mr. A. B. Baker.

The Museum purchased from the same gentleman a pair of extraordinarily large specimens of Ord's pocket-mouse, *Dipodomys Phillipsii Ordii*, for exhibition at New Orleans. Mr. Lewis Sells presented an exceedingly fine puma, *Felis concolor*, which was mounted in the best manner by the chief taxidermist, and was also sent to the New Orleans Exhibition. Skins of a red lynx, peccary, mountain sheep, and beaver, and one or two smaller forms were purchased from Mr. H. A. Ward for exhibition at the same place, the collection being found wanting in mountable specimens of these animals.

The most important faunal collections have been those of Mr. C. H. Townsend, from California, and Mr. E. W. Nelson, from Arizona. The former collection includes fresh specimens of nearly all the important terrestrial mammals of California and aquatic species as well. Worthy of special mention is an extensive series of antlers of the Columbian deer, *Cariacus columbianus*, showing numerous curious variations. Mr. Nelson's collection consists mostly of rodents and other small forms, but he has recently been in quest of the large species.

British America and Alaska.—The officers of the Signal Bureau stationed at Point Barrow sent, in connection with other specimens, a large series of skins of the lemmings, *Cuniculus torquatus* and *Myodes obensis*. From British America the most important accession is the collection of skins and skeletons made by Mr. Lucien M. Turner in the vicinity of Hudson's Bay. The series included two very fine skins of the Polar hare, *Lepus timidus*, one of which was sent to the New Orleans Exhibition.

Central America and the West Indies.—Mr. Benedict, naturalist of the U. S. Fish Commission steamship Albatross, while in the West Indies, secured after much labor a number of specimens of the so-called fishing bat, *Noctilio leporinus*, var. *mastivus*, and of the common artibeus, *A. perspicillatus*. The authorities of the British Museum presented a series of specimens of West Indian and Central American bats, representing species previously wanting in our collections.

The department has also received from Mr. Zeledon a number of Costa Rican mammals, including a specimen of *Felis yaguarundi*, from which a skeleton will be prepared.

Other parts of the world.—As already stated, the number of exotic mammals received during the year has been quite large, owing principally to the great number of donations from dealers in live animals and proprietors of menageries and zoological gardens. Messrs. Barnum, Bailey & Hutchinson, Messrs. C. and E. Reiche, Mr. W. A. Conklin (superintendent of the Central Park Menagerie, New York), and the authorities of the Dime Museum, Washington, have together presented no less than 27 monkeys. The first-named gentlemen have also sent several other important animals, such as an eland, a harnessed antelope, a leopard, a peccary, and two hunting-leopards. Mr. Conklin sent, in addition to the monkeys, a specimen of the curious lemur, *Stenops tardigradus*, a second lemur, a kangaroo,. an Egyptian jumping-mouse, a mongoose, a fruit-eating bat, and a young hog-deer. Mr. Lewis Sells, of Cincinnati, presented, in addition to the puma mentioned on page 130, a fine wart-hog and a baboon.

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* Proc. U. S. Nat. Mus., VII, July 29, 1884, pp. 170, 171.

† Trans. Linn. Soc. New York, II, 1884.

Surgeon-Major Dobson, of Netley, England, in consideration for some American insectivores sent him for dissection, has presented a collection of Asiatic and European bats and insectivores. In the collection made by Mr. P. L. Jouy in Japan were found a number of the characteristic mammals of those islands. Dr. Leonhard Stejneger, during his visit to Eastern Siberia, procured a very fine series of skulls of the brown bear, *U. arctos*, and two skins of the Siberian sheep, *O. nivicolea*. His collections of aquatic mammals will be mentioned in another place (see below). While in London the curator purchased a small collection of exotic mammals, including a skin of *Galidia olivacea*, and a skull of the rare lemur, *Propithecus holomelas*. Other similar specimens were purchased from Mr. H. A. Ward, of Rochester, among them a specimen of Rüppell's monkey (*Guereza Rüppelli*), a civet cat, and a llama.

AQUATIC MAMMALS.

Seals.—A number of important pinnipeds were received during the year. The last boxes of specimens collected by Dr. Leonhard Stejneger in Bering Island contained a very large series of skulls of Steller's sea-lion, *Eumetopias Stelleri*, the harbor seal, *P. vitulina*, &c., and, in addition, a skull of the Pacific walrus.

Mr. C. H. Townsend has sent specimens of the pinnipeds of the Californian coast, notably skeletons and skins of the California sea-lion, *Zalophus californianus*. Four skeletons of the harp seal were purchased from a Newfoundland whaler, through Dr. C. H. Merriam; and from Captain Longstreet, of the life-saving station at Manisquan, N. J., was received a fresh specimen of *Phoca vitulina*.

Cetaceans.—The year has been a notable one so far as cetaceans are concerned. Specimens have been received from about ten different sources. Of the greatest value are the skulls of ziphioid whales collected by Dr. Stejneger in Bering Island, and representing three genera, *Berardius*, *Ziphius*, and *Mesoplodon*. A skull of *Berardius* from New Zealand was purchased from Mr. Ward, of Rochester, in order that the proper comparisons might be made. The Zoological Museum of Oxford University, through Professor Moseley, presented a cast of the beak and teeth of the remarkable ziphioid known as ***Mesoplodon Layardii.*** Not less interesting are the casts of the head type-skins of ***Prodelphinus obscurus*** and ***Cephalorhynchus Heavisidei*** presented by the British Museum through Dr. Günther. Two other European institutions, the Royal College of Surgeons (Prof. W. H. Flower) and the Cambridge University Zoological Museum (Mr. John W. Clarke) presented specimens of cetacea, namely, skeletons of the blackfish and common bottle-nosed dolphin. The U. S. Fish Commission captured several porpoises, and presented in addition the skull of the large fin-back whale (***Balænoptera***). The curator was also instructed to investigate the porpoise fisheries of Hatteras and Cape May, and from each locality brought skeletons of the bottle-nosed dolphin, ***Tursiops tursio.*** He also purchased in Europe and presented to the Museum the skulls of three important species of the ***Delphinidæ.***

Sirenians.—The chief addition to the specimens representing this order was a skeleton of a very large Florida manatee.

DOMESTIC ANIMALS.

The curator has long had in view the assembling of a series of mounted skins and skeletons of the different races of the dog and other domestic animals. Considerable material has already accumulated, and during the year four dogs were added to the series. These were a St. Bernard dog from Messrs. Jacobs (of Washington), a Laverack setter from Mr. Schneider (of Washington), a Chinese hairless dog from Mr. Buchsbaum (of Washington), and an Eskimo dog from the Greely Relief Expedition.

ROUTINE WORK.

Work upon the general collection of the department (both the exhibition and study series) suffered almost complete cessation, from two very important causes. The curator was given permission to pursue certain studies in Europe during the winter of 1883–'84, and did not return to Washington until May. Very soon after his return the appropriations for the New Orleans Exhibition were made by Congress, and this department, together with others in the Museum, entered upon the work of preparing a series of specimens worthy of exhibition at that exposition. This work practically occupied the attention of the entire staff of the department until the close of the year. Time was found, however, for the performance of a few details of regular work, and these I will enumerate before entering upon a discussion of the work performed in connection with the New Orleans Exposition.

WORK IN THE EXHIBITION HALLS.

During the absence of the curator, the question of hanging whale-skeletons and other similar specimens was settled favorably, and in consequence the specimens of the hump-back and fin-back whales, which had encumbered the floor in the east-south range, were suspended from the ceiling. The large wall-case of the north side of the same range was completed early in the year and filled with such specimens as were ready. A considerable number of skeletons of the larger ruminants proved too large to be accommodated in this case, and were therefore placed temporarily upon the tops of certain of the table-cases. At the same time a large terraced base was planned for the south side of the range which should ultimately receive them. This stand has been very recently completed, and will be occupied early in 1885.

Almost no changes have taken place in the hall devoted to mounted mammals, except the return of certain seals exhibited at the London Fisheries Exhibition in 1883, and the removal of others intended for the New Orleans Exhibition. The cast of the ziphioid whale captured on the coast of New Jersey in 1883 has been completed, and is suspended from the ceiling on the east side of the hall. The exhibition series has been several times carefully examined to preserve it against destruction by insects.

WORK UPON THE STUDY SERIES.

The study series both of skins and bones have also been carefully examined to the same end. The collection of alcoholic bats was identified throughout.

This small amount of progress is not at all commensurate with the desires of the curator, but it was impracticable to do more under the circumstances.

The curator has received no extra assistance in the office during the year. Mr. W. G. Stimpson has acted at once in the capacity of general assistant, copyist, and messenger, performing these multiform duties very faithfully and satisfactorily. The force of taxidermists and osteological preparators was decidedly increased, the former in connection with the New Orleans Exhibition, as will be presently noted. Mr. Hornaday and Mr. Lucas remain in charge of this work as heretofore, under the direction of the curator. More or less work has been done for the department, as in former years, by Messrs. Joseph and William Palmer.

During the absence of the Assistant Director in the summer, the curator was called upon to act in his stead. He has not been relieved of the care of the library, which occupies much time.

THE NEW ORLEANS EXPOSITION.

Even before money had been appropriated for this exposition, plans for a display of the mammalia were under discussion. These were at first of a very comprehensive character. It was intended that the entire existing mammalian fauna of North America from the Isthmus of Panama northward should be exhibited species by species, and both by skins or casts and skeletons, and that some of the more important extinct fauna should be restored. This plan necessarily suffered much modification after a short time, when it was found that neither money, time, nor materials sufficient to assemble such a collection before the opening of the exposition were at command.

With the intention, however, of having every important species represented, the curator visited the establishments of all the principal dealers in natural-history material, and the collection of duplicates in the Museum was also drawn upon very largely. It was found that only a very small number of species were anywhere on sale, and that the Museum must rely upon its own resources. This it was able to do to a very considerable extent, although it was found necessary to withdraw some mounted specimens from the regular exhibition series, a proceeding which the curator carried out with great reluctance.

The force of taxidermists was raised to five, and, in addition, many small species were sent to Mr. F. S. Webster. The specimens were divided by the chief taxidermist among his assistants, and the work was done carefully, thoroughly, and in time. Toward the end of fall lack of funds caused a reduction of the force to three, which somewhat embarrassed the work.

During the summer the taxidermists together mounted 68 specimens, including several large forms, such as a bison, puma, jaguar, beaver, coyote, &c., which occupied necessarily a great amount of time. In addition to these, 81 specimens were mounted by Mr. Webster and his assistants, making in all 149 specimens. A few in each lot were not sent, while on the other hand 62 specimens were taken from the regular series of the Museum. The total number of specimens exhibited was 160, representing 150 species and varieties. The series includes all the North American ruminants except the musk-ox; all the important carnivores, both aquatic and terrestrial (especially the fur-bearing family, *Mustelidæ*); all the native beneficial or noxious rodents; representative species of porpoises; the manatees; and the more characteristic monkeys, sloths, bats, and insectivores. In addition a series intended to represent all the orders of the class mammalia was prepared.

The collection was exhibited in four large cases, except the ruminants, for which a separate, large, terraced stand was provided. The first case contained the cats, dogs, bears, &c.; the second the seals and whales; the third the monkeys, weasels, bats, and insectivores and the first group of rodents; the fourth, the remainder of the rodents, the edentates, and opossums, and the series representing the orders of mammalia. The large terraced stand, as already stated, supported only the ruminants.

It will be observed that this collection, although considerably smaller in point of number of specimens than that exhibited at the Centennial Exposition, still contained representatives of almost the same number of species.

In addition to the specimens already mentioned, another small series was sent to New Orleans, representing the character of work done in connection with the section of osteology. It was at first intended that the different species of mammals should be as well represented by skeletons as by mounted skins, but this plan was in the end found impracticable and was finally abandoned.

Although the performance of so considerable amount of work for a special purpose has kept the regular work of the department in abeyance, it is hoped that the Museum may benefit by it ultimately, both by the addition of the mounted specimens to its exhibition series and on account of the experience gained by the taxidermists in rapid work.

INVESTIGATIONS PROSECUTED DURING THE YEAR 1884.

During the winter of 1883 and the spring of 1884 the curator was engaged in studies upon the cetacea in the European museums. Finding it very difficult to identify the material which has accumulated in the department of mammals, he conceived the idea of examining for himself the types of Gray and other writers, which are still extant in the museums of Europe. With this intent, and also for the purpose of studying certain details of museum installation, he visited the following establishments: Royal College of Surgeons, London; British Museum of Natural History, London; University Zoological Museum, Cambridge; University Zoological Museum, Oxford; Norwich Museum; Public Museum of Science and Art, Liverpool; Museum of Art and Industry, Edinburgh; Museum d'Histoire Naturelle, Paris; Zoological Museum, Leyden, and a number of less important institutions. The types of toothed cetaceans of Gray, Flower, Cuvier, Gervais, Schlegel, and others were examined and measured. The report upon this investigation is unfortunately still unpublished, owing to the pressure of other work, but it is the intention of the curator that it shall be finished and sent to the printer at an early date.

These studies are intended as a basis for a monograph of the toothed whales of North America, preparations for which are already well advanced. The collection of cetacea in the National Museum is unquestionably the finest in America, and includes a large number of type-specimens. The work can therefore be partially completed without reference to other collections, although the latter must in the end be consulted.

The necessary work upon the cetacea is so great that the curator scarcely hopes to be able to extend his researches upon the mammalia in other directions for the present.

In addition to the insectivores sent to Dr. G. E. Dobson, of Netley, England, in 1883, a large number of shrews have been confided to his care for comparison with the great series already in his hands. The family *Soricidæ* will be treated of in the third and concluding part of his work upon the insectivores, the first two sections of which have already appeared.

Dr. Harrison Allen, of Philadelphia, still continues in possession of a portion of the Smithsonian collection of Chiroptera, for use in his studies upon the organs of locomotion in this group. Certain other specimens of bats were temporarily loaned to Mr. F. W. Cragin, of Manhattan, Kansas, who is engaged in work upon the species native to that State.

With the completion of the work upon the cetacea and insectivores of North America now in progress, the time will be ripe for the publication of an encyclopædic systematic work upon the entire mammalian fauna of North America, similar to that published by Professor Baird in 1859. After such a work shall have been published attention will doubtless be turned toward the anatomy, physiology, and embryology of the different species, concerning which very little has thus far been written.

Papers published in 1884 by the curator and by others connected with the department, or upon the basis of material belonging to the department, amount to twelve, and are referred to in the bibliography under True, Elliott, and Nelson.

PRESENT CONDITION OF THE COLLECTION.

The collection of mammals can at present be divided into but two series, namely, (1) the exhibition series, and (2) the stored or duplicate series.

The exhibition series.—The number of mounted skins on exhibition at the close of 1883 and 1884, respectively, was as follows: On exhibition at the close of 1883, 715; on exhibition at the close of 1884, 646.

It will appear somewhat surprising at first that at the end of a new year's work by the taxidermists the number of specimens on exhibition should be less than previously. The reason of this becomes very obvious, however, when it is remembered that not only the specimens mounted during the year were sent to New Orleans, but, in addition, some that had previously been on exhibition in the hall. If we add to the number given above, the specimens sent to New Orleans and those now in the taxidermists' shops in a nearly completed state the total reaches 864, which represents a somewhat less number than will be on exhibition in July, 1885, but many more than were displayed at the close of 1883.

Duplicate series.—To gain an idea of the present size of this series it is only necessary to add to the figures given in last year's report the number of accessions for 1884, since no distributions have been made. The totals are as follows:

Skins and alcoholic specimens, 1884	4,870
Skeletons and skulls, 1884	4,087
Total	8,957

The total number of specimens in the collection is, therefore, as follows:

Skins and alcoholic specimens	5,694
Skulls and skeletons	4,214
Total	9,908

Although no distributions have been made during the year, a considerable number of specimens have been temporarily loaned for study.

These are as follows:

To Dr. G. E. Dobson, Netley, England	35 specimens	= 35 species
To F. W. Cragin, Manhattan, Kans	17 specimens	= 17 species
To Godman & Salvin, London, England	16 specimens	= 16 species
Total	68 specimens	= 68 species

RECOMMENDATIONS AND GENERAL REMARKS.

In the exhibition series the original idea of having the North American fauna exhaustively represented is still adhered to; but, in addition, every effort is being made to procure as many representative exotic forms as possible.

During the coming year the taxidermists will be engaged in mounting the skins now in bath, beginning with the primates and following through each lower order. By this plan the curator is saved a great amount of labor in identifying and labeling the specimens, since it enables him to deal with one branch of the literature at a time. It also facilitates the work of estimating the number of new cases of each style needed, and makes the growth of the collection apparent.

Some provision must shortly be made for the protection of the larger species, of which the Museum possesses some very fine and also unique specimens. It is perhaps not too much to say that no museum in the world has yet successfully solved the problem of proper casing for the large mammalia, and it is evident, therefore, that a great amount of thought must be bestowed upon the subject if this Museum is to succeed where others have failed.

During the coming year the organization of the Department of Comparative Anatomy will probably be effected. A large number of specimens of the viscera of mammals have been accumulated, in the hope that they may be of service in the formation of a comparative organological collection.

By a change in the location of the offices of the department, the curator hopes to be able to place a reference series, especially of the North American mammalia, where it will be more readily accessible than hitherto. In the present cramped condition neither books nor specimens can be consulted without great inconvenience and loss of time.

LIST OF ACCESSIONS FOR 1884.

Mr. S. G. Abbie, Brownsville, Me. Skeleton of a fisher (***Mustela Pennantii***), four skeletons of the red fox (***Vulpes fulvus***), and two skeletons of the Canadian porcupine (***Erethrizon dorsatus dorsatus***).

Mr. S. F. Adams, Beadle County, Dakota. A shrew in alcohol (***Sorex*** sp.).

General O. E. Babcock, U. S. A. Skin of a bat.

Mr. A. B. Baker, Banner, Kans. A collection of skins from Kansas and New Mexico, embracing five prairie dogs (***Cynomys ludovicianus***), two kangaroo rats (***Dipodomys Phillipsi Phillipsi***), one line-tailed spermophile (***Spermophilus*** 13-***lineatus***), one harvest mouse (***Hesperomys leucopus***), and one bat in alcohol (***? Vespertilio arsinoë***). (Purchased.)

Messrs. Barnum, Bailey & Hutchinson, Bridgeport, Conn. Eleven monkeys, one eland (***Oreas canna***), one harnessed antelope (***Tragelaphus scripta***), one peccary (***Dicotyles tajacu***), one leopard (***Felis pardus***), and one hunting-leopard (***Cynælurus jubata***).

Mr. Joseph H. Batby, Upper Amazon, Brazil. A monkey (***Pithecia*** sp.) skin.

Capt. Charles Bendire, U. S. A. A kangaroo rat (***Dipodomys Phillipsi***), from Fort Walla Walla, Wash.

British Museum Natural History, London, England. A collection of ten bats in alcohol; casts of the heads of the type specimens of ***Prodelphinus obscurus*** and ***Cephalorhynchus Heavisidei***.

Mr. H. Buchsbaum, Washington, D. C. Skeleton of a young Chinese hairless dog.

Mr. R. Ellsworth Call, Washington, D. C. A bat in alcohol.

Cambridge University Zoological Museum, Cambridge, England. Skeleton of a bottle-nosed dolphin (***Tursiops tursio***).

Cape May Porpoise Fishing Company, Cape May, N. J. Skeleton of a bottle-nosed dolphin (***Tursiops tursio***).

Mr. J. C. Catlin, Ravenna, Ohio. A nest of the red squirrel (***Sciurus hudsonius hudsonius***).

Prof. J. W. Chickering, Deaf and Dumb Asylum, Washington, D. C. Example of a monstrous hog.

Prof. F. W. Clarke, U. S. National Museum, Washington, D. C. A hair-ball from the stomach of an ox.

Capt. J. W. Collins, U. S. Fish Commission. Skull of a reindeer (***Rangifer tarandus***) from Holsteinberg, Greenland. (Purchased.)

Mr. W. A. Conklin, superintendent, Central Park Menagerie, New York, N. Y. Seven monkeys, two lemurs, one jumping-mouse (***Dipus*** sp.), one fruit-eating bat (***Pteropus*** sp.), one civet cat (***Viverra civetta***), one Indian fawn (***Cervus porcinus***), one great kangaroo (***Macropus gigas***).

Mr. F. W. Cragin, Manhattan, Kans. Skin of a bat (***Atalapha cinerea***).

Mr. John Cross, Manatee County, Florida. Portion of a rib of a manatee (***Trichechus latirostris***).

Dr. Elliott Coues, Smithsonian Institution, Washington, D. C. Skin of the rare squirrel (*Sciurus arizonensis*).

Surg. Major G. E. Dobson, Royal Victoria Hospital, Netley, England. A collection of thirteen bats and five insectivores in alcohol.

Mr. John R. Edkin, Washington, Ark. Fragments of the skulls of a man and a horse.

Mr. Vinal N. Edwards, Wood's Holl, Mass. Skeleton of a harbor seal (*Phoca vitulina*).

Dr. J. M. Flint, U. S. N. Dry anatomical preparation of a human fœtus.

Mr. William Fuller, East Penfield, N. Y. Two skeletons of raccoons (*Procyon lotor*); three skeletons of muskrats (*Fiber zibethicus*); three skeletons of minks (*Putorius vison*); and one skeleton of an ermine (*Putorius erminea*).

Mr. Daniel Grinnan, Port Gibson, Miss. Tooth of a horse.

C. G. Gunther & Sons, New York, N. Y. Mounted group of Virginia deer (*Cariacus virginianus*), and melanistic wolf (*Canis lupus*).

Mr. Manly Hardy, Brewer, Me. Skeleton of a fox (*Vulpes fulvus*).

Ensign Charles H. Harlow, U. S. N. Greely Relief Expedition. Skin of an Eskimo dog.

Mr. George C. Hazleton, Washington, D. C. Skeleton of a red bat (*Atalapha noveboracensis*).

Mr. H. W. Henshaw, Washington, D. C. A fresh specimen of a flying squirrel (*Sciuropterus volucella hudsonius*).

Mr. C. J. Hering, Surinam. A bat in alcohol (*Molossus rufus*).

Mr. B. Holtzlander, Washington, D. C. Skin of a domestic cat (*Felis domestica*).

Mr. William T. Hornaday, U. S. National Museum, Washington, D. C. A rabbit in the flesh (*Lepus sylvaticus*).

Mr. T. S. Hovey, Puyallup Valley, Washington Territory. Tooth of a horse.

Capt. T. B. Hunt, U. S. A. Skull and skin of the head of a mountain sheep (*Ovis montana*).

Ipswich Museum, England. Two ear-bones of a fossil whale from the Crag formations.

Jacobs Bros., Washington, D. C. Skin of a St. Bernard dog.

Dr. William H. Jones, U. S. N. Four human skulls from the plains of Wuimanolo, Oahu, Hawaii Islands; and fifty-two human skulls from Ancon, Peru.

Mr. P. L. Jouy, Japan. A collection of seven mammals from Japan, embracing a pair of horns of the Japanese goat (*Nemorhedus crispus*); one skin of a marten (*Mustela* sp.); two skins of the flying squirrel (*Pteromys* sp.); one skin of the common mouse (*Mus* sp.); one skin of a bat; and a skin of a Japanese otter (*Lutronectes Whitelyei*).

Dr. J. W. Kales, Union Springs, N. Y. Fragments of human skulls.

Mr. George Kiefer, Ancon, Peru. Nine human skulls; skull of a sea-lion (*Otaria jubata*), and the horns of the domesticated sheep.

Mr. George R. Kleeberger, Northern California. Vertebral column of a rabbit (*Lepus* sp).

Mr. R. Longstreet, Keeper U. S. Life-Saving Station, Manisquan, N J. A harbor seal in the flesh (*Phoca vitulina*).

Dr. R. McCallum, Westville, Miss. A bat in alcohol (*Plecotus* sp.).

Ensign C. S. McClain (Greely Relief Expedition). Skull of a bear and skeleton of an arctic fox (*Vulpes lagopus*) from Greenland.

Mr. L. M. McCormick, U. S. National Museum, Washington, D. C. A red squirrel (*Sciurus hudsonius hudsonius*), and three young rabbits (*Lepus sylvaticus*).

Mr. R. McFarlane, Chipewyan, Hudson Bay Territory. Skin of an albino marten (*Mustela americana*), and a muskrat (*Fiber zibethicus*).

Mr. John J. McLean, U. S. Signal Bureau. Two skins of Steller's sea lion (*Eumetopias Stelleri*) from Cape Mendocino, California, and three human skulls from Alaska.

Dr. J. A. McNiel, Chiriqui, Central America. A human skull.

Mr. James P. McTeer, Wytheville, Va. A monstrous hog.

Dr. W. V. Marquis, Bennett, Pa. Sacrum of an elk (*Cervus canadensis*), and tooth of a domestic sheep.

Mr. Charles H. Marsh, Silver City, N. Mex. A rabbit skin (*Lepus sylvaticus*).

Mr. Frederick Mather, Forest and Stream Publishing Company, New York. A mouse (*Hesperomys leucopus*) in alcohol, from Suffolk County, New York.

Dr. C. Hart Merriam, Locust Grove, N. Y. Four skeletons of the harp seal (*Phoca grœnlandica*) from the coast of Labrador.

Mr. Minus Miller, Knoxville, Iowa. Skin of the silver fox (*Vulpes fulvus argentatus*).

Mr. E. W. Nelson, Tucson, Ariz. A collection of eleven small mammals from Arizona.

Norwich Museum, Norwich, England. Two ear-bones of a fossil whale from the Crag formations.

Mr. Charles R. Orcutt, San Diego, Cal. Specimen of a gopher in alcohol (*Thomomys talpoides*).

Mr. William H. Palmer, U. S. National Museum, Washington, D. C. A bat (*Scotophilus georgianus*) and a harvest mouse (*Hesperomys leucopus*) in the flesh.

Mr. George Poole, Dime Museum, Washington, D. C. Three monkeys and an opossum in the flesh.

Lieut. P. L. Ray, U. S. N., and *John Murdock, U. S. Signal Bureau.* A collection of sixty-four mammal skins and thirty-seven skeletons, from Point Barrow, Alaska.

Mr. John Richardson, U. S. National Museum, Washington, D. C. A collection of twelve mammal skins.

Mr. Robert Ridgway, U. S. National Museum, Washington, D. C. Alcoholic specimen of the red bat (*Atalapha noveboracensis*), caught in the National Museum.

Mr. James W. Rogan, Rogersville, Tenn. A field mouse (*Arvicola* sp.) in alcohol.

Mr. J. H. Rowland, Hagerstown, Md. A monstrous lamb.

Mr. Fred. Sauter, New York, N. Y. Skin of a Tayra (*Galictis barbata*).

Capt. C. M. Scammon, California. Two teeth of Stearns's grampus (*Grampus Stearnsii*) from the Californian coast.

Mr. Henry Schneider, Washington, D. C. Skin of a Laverack setter.

Mr. Lewis Sells, Cincinnati, Ohio. Skin of puma (*Felis concolor*); a wart-hog in the flesh (*Phacochœrus æthiopicus*), and a baboon (*Cynocephalus anubis*).

Dr. R. W. Shufeldt, U. S. A. A collection of four rodents and seven bats from Louisiana.

Mr. A. L. Siler, Utah. A human skull.

Mr. Alexander Skinner, U. S. National Museum, Washington, D. C. Three muskrats (*Fiber zibethicus*) and three flying squirrels (*Sciuropterus volucella*) in the flesh.

Mr. George Smith, Prince George's County, Maryland. A red squirrel (*Sciurus hudsonius hudsonius*) in the flesh.

Mr. W. F. Smith, Webster City, Iowa. Broken skull of a wolf (*Canis lupus griseo-albus*).

Mr. R. E. C. Stearns, U. S. National Museum, Washington, D. C. Skull of a rabbit (*Lepus californicus*); three teeth of an elk (*Cervus canadensis*); a tusk of a fossil elephant (*Elephas* sp.) from California.

Dr. Leonhard Stejneger. A collection of mammals from Bering Island and Kamtschatka, one hundred and twenty-seven in number, including skulls of Rhytina and three species of ziphioid whales.

Col. James Stevenson, U. S. Geological Survey. Two skins of wood rat (*Neotoma* sp.) and one skin of kangaroo mouse (*Dipodomys Phillipsi Ordi*) from Lee's Ferry, Ariz.

Royal College of Surgeons, London, England (through Mr. W. L. Crowther). Skeleton of a blackfish (*Globiocephalus melas*) from Tasmania.

Mr. R. S. Tarr, U. S. National Museum, Washington, D. C. A bat (*Vespertilio lucifugus*) in alcohol from Wood's Holl, Mass.

Mr. Charles H. Townsend, U. S. Fish Hatching Station, Baird, Shasta County, California. A collection of one hundred and eighty-three skins and fifty-two skeletons of Californian mammals.

Mr. F. W. True, U. S. National Museum, Washington, D. C. A small collection of skins and skulls of exotic mammals.

Mr. H. W. Turner, U. S. Geological Survey. A pale bat (*Plecotus macrotus*), a field mouse (*Arvicola riparius*), and a gopher (*Thomomys talpoides*) in the flesh; from California.

Mr. Lucien M. Turner, U. S. Signal Bureau. A collection of eighty-one skins from Ungava Bay, and Labrador, British America.

U. S. Fish Commission, Wood's Holl, Mass. Alcoholic bat and three young rabbits from Saint Mary's, Fla.; twenty-one bats from the West Indies; two skeletons of common dolphin (*Delphinus delphis*) and one skeleton of bottle-nosed dolphin (*Tursiops tursio*) from Wood's Holl, Mass.; skull of a whale (*Balænoptera Sibbaldii*), and two epiphyses of a whale.

John and Charles Walker, Olney, Ill. Three bats in alcohol.

World's Industrial and Cotton Centennial Exhibition, New Orleans, La. (*purchased of Prof. H. A. Ward, Rochester, N. Y.*):

Skins of the following animals: Wolverine (*Gulo luscus*); lynx (*Lynx rufus*); civet cat (*Viverra zibethica*); peccary (*Dicotyles tajacu*); porcupine (*Synetheres prehensilis*); guanico (*Auchenia guanico*); mountain sheep (*Ovis montana*); Trowbridge's hare (*Lepus Trowbridgei*); beaver (*Castor fiber*).

Skeletons of the following animals: Wolverine (*Gulo luscus*); lynx (*Lynx rufus*); coati (*Nasua narica*); coyote (*Canis latrans*); mule deer (*Cariacus macrotis*); antelope (*Antilocapra americana*); whale (*Sotalia* sp.), skull; kangaroo (*Macropus gigas*); wombat (*Phascolarctos cinereus*); whale (*Berardius Arnuxi*), skull; manatee (*Trichechus manatus*).

Mr. William Wittfeld Georgiana, Fla. A collection of nine mammals from Georgiana, including the typical specimen of *Neofiber Alleni*.

Mr. A. F. Wooster, Norfolk, Conn. Skin of a red squirrel (*Sciurus hudsonius hudsonius*).

Mr. W. S. Yaste, U. S. Geological Survey, Washington, D. C. A bat (*Vespertilio lucifugus*).

Mr. José C. Zeledon, San José, Costa Rica. Two opossum skins (*Didelphys* sp.); a squirrel (*Sciurus* sp.); a field mouse (*Hesperomys* sp.); a gopher (*Geomys hispidus*), and a skeleton of the Yaguarundi cat (*Felis yaguarundi*).

V.—REPORT UPON THE DEPARTMENT OF BIRDS IN THE U. S. MUSEUM, 1884.

By ROBERT RIDGWAY, *Curator.*

The year 1884 was wholly unprecedented in the extent, if not in the number, of accessions to the collections of the Department of Birds, and the amount of work accomplished by the curator and his assistants. To the latter are due especial mention, as follows:

Capt. Charles E. Bendire, U. S. A., who gratuitously rendered most valuable service in the entire rearrangement and labeling of the oological collection, a labor requiring his personal supervision during seven months. Mr. C. W. Beckham, who until July 1 assisted Captain Bendire in the arrangement and cataloguing of the oological collection, and after that date rendered efficient aid in the preparation of the New Orleans exhibit. Mr. Henry Marshall, taxidermist of the department, whose skilled work added many attractive specimens to the exhibition series. Mr. George Marshall, engaged after July 1 as assistant taxidermist. Miss Harriet S. Perkins, assigned specially to the oological section, and who has therein rendered very efficient service. Mr. C. W. Shoemaker, who performed various clerical duties until December 1, when lack of funds necessitated his being dropped from the rolls. Mr. Hugh M. Smith, who performed with great satisfaction the various duties assigned him during his term of service, which extended from July 1 to December 1. Dr. Leonhard Stejneger, who, appointed as assistant on the New Orleans exhibit from July 1 until December 1, and after the latter date as assistant curator, rendered most valuable service to the department.

ACCESSIONS TO THE BIRD COLLECTION.

(*a*) *Skins and alcoholic specimens.*

The number of birds, chiefly skins, which were added to the collection during 1884 is 8,142 (Museum register Nos. 93092–101233), by far the largest number received in one year in the history of the Museum. The more important accessions were the following:—

Aiken, C. E., Colorado Springs, Colo.: 14 specimens, 3 species, from Colorado. (Purchased.)

Batty, J. H., Parkville, Long Island, N. Y.: 50 specimens, 34 species, from Europe, Peru, and various parts of the United States. (Exchange.)

Belding, L., Stockton, Cal.: 13 specimens, 5 species, from San Diego, Cal. (Gift.)

———. 4 species from Lower California and an interesting series of *Passerculus beldingi* (sp. nov.) from San Diego. (Gift.)

Bendire, Capt. Charles E., U. S. A.: 304 specimens, 92 species, from Fort Klamath, Oreg. (Gift.)

Benedict, J. E., and Nye, W., Jr., U. S. Fish Commission: 94 specimens, 44 species, collected during the cruise of the Fish Commission steamer Albatross, at St. Thomas, W. I., on the islands of Trinidad, Mona, Curaçoa, and Old Providence, and at Sabanilla, New Granada. Of the 10 species collected at Curaçoa and Old Providence, 8 were new to science. A pair of the interesting oil bird or guacharo (*Steatornis caripensis*) were collected at Mona Island. (See notice of special paper on this collection, in list of papers based on material in the National Museum collection.)

Bergen Museum, Bergen, Norway (through Dr. L. Stejneger): 78 specimens, 45 species, chiefly from Norway. (Exchange.)

Berlepsch, Count von, Muenden, Germany: 81 specimens, 66 species, of neotropical birds, many of them new to the collection; also, 20 specimens, 18 species, from Malacca—nearly all previously unrepresented. (Exchange.)

Bicknell, Eugene P., Riverdale. N. Y.: Pair of *Hylocichla aliciæ bicknelli;* new to the collection. (Gift.)

Blakiston, Capt. T. W.: 675 specimens, chiefly from Japan, as follows: 149 species from Japan, 76 from China, 63 from England, 3 from Kamtschatka, 2 from India; total 293 species. (Gift.) (This collection is specially important, having been made during a 20 years' residence in Japan, and forming the basis of Captain Blakiston's various papers—also those of other writers—on the birds of that country. Its acquisition, together with the collection made by Mr. P. L. Jouy, renders the National Museum collection of Japanese birds perhaps the most complete extant.)

Boardman, George A., Calais, Me.: 1 burrowing owl and 1 specimen of *Crotophaga ani*, from Florida. (Gift.)

British Museum, London, England (through Mr. R. E. Earll, U. S. Fish Commission): 126 specimens, 100 species, from various localities in Asia, Africa, and Australia. (Gift.)

———. *(through Dr. T. H. Bean, Curator, Department of Fishes, U. S. National Museum):* 247 specimens, 204 species, chiefly from India. (Gift.)

Bryant, D. S., Oakland, Cal. (through L. Belding, Stockton, Cal.): An interesting series of *Passerculus sandwichensis bryanti* (subsp. nov.), from Oakland, Cal. (Gift.)

Coale, H. K., Chicago, Ill.: 14 species, chiefly from India, 5 of them new to the collection. (Exchange.)

———. 29 specimens, 27 species (several new to the collection), from various localities. (Exchange.)

Coale, H. K., Chicago, Ill.: 40 specimens, 24 species, of water birds, chiefly from Northern Illinois. (Exchange.)

———. 70 specimens, 54 species, mostly from Wadale, India; with some from the United States, Europe, and Australia. (Exchange.)

———. 7 specimens, same number of species, 4 from South America, 1 from Costa Rica, and 1 from Moluccas. (Exchange.)

———. 42 specimens, 24 species, from various localities in the United States and a few from Europe and India. (Exchange.)

———. 1 specimen of *Munia malabarica* from Wadale, India. (Gift.)

———. Specimen of *Buteo borealis krideri* from Illinois; new to the collection. (Gift.)

Conklin, W. A., superintendent Menagerie, Central Park, New York City (through W. T. Hornaday, chief taxidermist, U. S. National Museum): 1 specimen of long-tailed Chinese rooster, from Central Park Menagerie, New York.

———. 1 specimen of *Grus leucogeranus*, from Central Park Menagerie, New York. (Exchange.)

Cory, Charles B., Boston, Mass.: 3 skins of *Picoides americanus*, from Maine. (Exchange.)

———. 1 skin of *Ligea palustris*, a new species, from St. Domingo. (Exchange.)

Crumb, Capt. C. H., keeper life-saving station, Cobb's Island, Virginia: 6 specimens of *Ammodromus maritimus* from Cobb's Island, Va. (Gift.)

Dowell, John, Washington, D. C.: Mounted specimen of *Porzana jamaicensis*, from Piscataway, Md. (Gift.)

Dutcher, William, New York City: 12 specimens of *Passerculus princeps* in flesh, from Long Island. (Gift.)

Edwards, Vinal N., Wood's Holl, Mass: 1 specimen of *Fratercula arctica*, from Wood's Holl, Mass. (Gift.)

Fisher, William J., United States tidal observer, Kodiak, Alaska: 23 specimens, 17 species, from Kodiak. (Gift.)

Forrer, A., Switzerland: 2 skins (♂ and ♀) of *Rhynchopsitta pachyrhyncha*, from Durango, Mexico; new to the collection. (Purchased.)

Fox, Dr. W. H., Washington, D. C.: 46 specimens, 35 species, chiefly from Lookout Mountain, Tennessee; the first specimens, with possibly one or two exceptions, which the Museum has ever received from that State. (Exchange.)

———. 75 specimens, 44 species, from Tennessee; including *Picus borealis* and *Quiscalus purpureus*, the first specimens of these species obtained west of the Alleghanies; also, two examples of *Peucæa æstivalis illinoensis*. (Exchange.)

Gaumer, G. F., Yucatan: 23 specimens, 12 species, from Yucatan (Purchased.)

Grebnitzki, Governor, Bering Island, Kamtschatka: 22 specimens, 12 species, from Bering Island. (Gift.)

Grinnell, George Bird, New-York City: 2 specimens of *Ortyx graysoni*, from Tucson, Ariz. (Gift.)

Harting, J. E., British Museum, London, England: 14 specimens, 11 species, chiefly wading birds, several of them new to the collection. (Exchange.)

Healy, Capt. M. A., U. S. Revenue Cutter Corwin: 46 specimens, 30 species, from Alaska. (Mostly in alcohol.) (Gift.)

Henshaw, H. W., U. S. Geological Survey: 33 specimens, 10 species of birds, from District of Columbia, Nevada, New Mexico, &c. (Exchange.)

———. 110 specimens, 48 species, chiefly from Colorado and New Mexico; also, 17 specimens, 10 species, chiefly from Carson City, Nev. (Exchange.)

Hinckley, Isaac, Currituck Sound, North Carolina: Hybrid duck (*Anas boschas + obscura*) in flesh. (Gift.)

Hornaday, W. T., chief taxidermist, U. S. National Museum: 37 specimens, 34 species, from Coimbatore, India. (Purchased.)

Jencks, Fred. T., Providence, R. I.: 1 specimen of *Lophophorus impeyanus*, from the Himalayas, India. (Exchange.)

Johnson, J. W., U. S. Signal Service: 19 specimens, 13 species, from Nushagak, Alaska.

Knowlton, F. H., U. S. National Museum: 3 skins of *Quiscalus æneus*, from Vermont. (Gift.)

Kœbele, Albert: 16 specimens, 13 species, from Brazil. (Gift.)

Macgregor, Miss Inez, Concord, Va.: 1 hybrid fowl (common fowl and Guinea-keet), from Concord, Va. (Gift.)

Marshall, George, Laurel, Md.: 3 specimens of *Loxia americana*, shot at Laurel, Md., May 23 and 25, 1884. (Gift.)

Marshall, H.: 1 specimen of *Nyctala acadica*, from Washington, D. C. (Gift.)

Maynard, C. J.: 22 specimens, 8 species, from Bahama Islands and South America. (Purchased.)

McCormick, L. M., U. S. National Museum: 1 specimen of *Ægialites melodus circumcinctus*, from Alexandria County, Virginia. (Gift.)

McDonald, Col. M., U. S. Fish Commission: 1 bald eagle in flesh, from Virginia. (Gift.)

McKay, C. L. (deceased), U. S. Signal Service, Nushagak, Alaska: 22 specimens, 12 species, including none of particular interest.

McLain, C. S., U. S. N.: 6 specimens, same number of species, from Greenland. (Gift.)

McLeod, Rev. R. R., Jesus Maria, Chihuahua, Mexico: 12 specimens, same number of species, from Chihuahua, Mexico. (Gift.)

Merrill, Dr. J. C., U. S. A.: 62 specimens, 39 species, from Fort Brown, Texas. (Gift.)

Moore, Julian A., Alexandria, Va.: 1 albino coot (*Fulica americana*) in flesh. (Gift.)

Nation, Prof. W., Lima, Peru: Peruvian birds, mostly new to the collection. (Gift.)

Nation, *Prof.* W., *Lima*, *Peru:* 6 specimens, same number of species, from Lima, Peru, 3 of them (*i. e.*, *Neorhynchus naseus*, *Polynomyia caroli*, and *Metallura opaca*) important additions to the collection. (Gift.)

Nelson, *E. W.*, *Tucson*, *Ariz.:* 768 specimens, 114 species, from Alaska, being a portion of Mr. Nelson's collection which had not been catalogued. From this lot and another which had been catalogued, but from which the Museum series had not been taken, a fair proportion was selected for the reserve collection of the Museum.

———. 21 specimens, 12 species, from Arizona, including the following particularly rare species: *Harporhynchus bendirei* (2), *H. crissalis* (3), *Pyranga cooperi* (2), *Helminthophila luciæ* (2), *Scops trichopsis* (1), and *Micrathene whitneyi* (1). (Purchased.)

———. 787 specimens, 136 species, from Arizona. (Purchased.)

———. 16 specimens, 7 species, from Arizona. (Purchased.)

———. 115 specimens, 35 species, from Arizona. (Purchased.)

Nye, *W.. Jr.*, *U. S. Fish Commission.* (See Benedict, J. E.)

Palmer, *W.*, *U. S. National Museum:* 2 specimens of *Scops asio floridanus*, from South Carolina; 1 adult ♂ *Accipiter cooperi*, from Virginia (mounted for exhibition series). (Gift.)

———. 15 specimens, 11 species, from Alexandria County, Virginia. (Gift.)

Ragsdale, *G. H.*, *Gainesville*, *Tex.:* 31 specimens, 12 species, from Cook County, Texas. (Purchased.)

———. 1 mounted specimen of *Buteo harlani* from Gainesville, Tex. (Purchased.)

Ray, *Lieut. P. H.*, *U. S. A.:* 288 skins, including 46 species, from Point Barrow, Alaska; also 33 specimens (6 species) of birds in alcohol, from the same locality. (U. S. Signal Office.)

Rey, *Dr. E.:* 25 specimens, same number of species, from various localities in South America, Europe, Asia, and Africa. (Purchased.)

Ridgway, *R.*, *Curator*, *Department of Birds*, *U. S. National Museum:* 1 adult male golden pheasant (*Chrysolophus pictus*), purchased in flesh for the Museum; also 4 birds in alcohol, and 3 mounted for the exhibition series, from Virginia.

Saunders, *Howard*, *London*, *England:* 5 specimens, 3 species, from South America, India, and Greece. (Exchange.)

Sauter, *Fred.*, *New York Ctiy:* 22 specimens, same number of species, from different parts of Europe, Asia, Africa, and South America. (Exchange.)

Schlüter, *Wilhelm*, *Halle*, *Germany:* 7 specimens, same number of species, from Siberia. (Purchased.)

Sharpe, *R. Bowlder*, *British Museum*, *London*, *England:* 66 specimens, nearly as many species, chiefly from Southern India (Lower Pegu, &c.). (Exchange.)

———. 256 specimens, 180 species, from India. Many species new to the collection. (Exchange.)

Shufeldt, Dr. R. W., U. S. A.: 17 specimens, 11 species, birds in alcohol, from Louisiana. (Gift.)

Slade, Elisha, Somerset, Mass.: Living pair of hybrid ducks (*Anas obscura+boschas*). (Gift.)

Stearns, Frederick, & Co., Detroit, Mich.: 24 specimens, 16 species, from Costa Rica and Jamaica. (Purchased.)

Stejneger, Dr. L., Assistant Curator, Department of Birds, U. S. National Museum: 4 specimens of swan (*Olor cygnus* and *Cygnus gibbus*) from Europe. (Gift.)

———. 1 specimen of *Tetrao tetrix*, sterile ♀, from Lund, Southern Norway. (Gift.)

———. 1 specimen of *Hypherpes corallirostris*, from Savary, Madagascar. (Gift.)

———. 74 specimens, 43 species, from various parts of Europe and Asia. (Gift.)

———. 3 specimens of *Lagopus albus alleni*, a new form, from St. John's, Newfoundland, including the type specimen. (Gift.)

———. 1 specimen of *Motacilla boarula*, 1 of *Pyrrhula vulgaris*, and 1 of *Sterna nigra*, from Norway. (Gift.)

———. 19 specimens, same number of species, from Brazil and Norway. Including an adult ♀ of *Falco gyrfalco*, new to the collection. (Gift.)

———. Skin of *Motacilla alba*, juv., *Troglodytes borealis* and *T. bergensis* sp. nov. (type), all new to the collection. (Gift.)

Townsend, Charles H.: 478 specimens from Northern California. (Smithsonian exploration.)

———. 55 specimens, from Farallone Islands, California. (Smithsonian exploration.)

Turner, Lucien M., U. S. Signal Service: 1,705 specimens, from Ft. Chimo, Ungava. (U. S. Signal Office.)

Ward, Prof. Henry A., Rochester, N. Y.: 7 specimens, same number of species, from Yokohama, Japan. (Exchange.)

———. 13 specimens, 10 species, from Australia and Tasmania. (Purchased.)

Wheeler, Capt. George M., U. S. A.: 30 specimens, 28 species, from Southwestern United States. (Residue of collection made by the U. S. Geological Survey west of 100th meridian.) (War Department.)

Wolford, W. L., Minneapolis, Minn.: 4 specimens of *Hesperiphona vespertina*, from Minneapolis, Minn. (Exchange.)

Worthen, Charles K., Warsaw, Ill.: 45 specimens, 26 species, from Western United States and Mexico. (Exchange.)

———. 39 specimens, 25 species, chiefly from Oregon and New Mexico. (Exchange.)

———. 12 specimens, 6 species, from New Mexico. (Exchange.)

———. 13 specimens, 7 species, chiefly from Western Oregon. (Exchange.)

———. 5 specimens, 2 species, from Warsaw, Ill. (Exchange.)

Worthen, Charles K., Warsaw, Ill.: 1 specimen of *Chordeiles henryi*, from Warsaw, Ill. (Exchange.)

———. 3 specimens, same number of species, from Silver City, N. Mex., including 1 specimen of *Peucæa ruficeps eremœca* (the second specimen acquired), and the type of a new species, *Spizella wortheni*. (Exchange.)

Zeledon, José C., San José, Costa Rica: 16 specimens, 15 species, from Costa Rica. (Several species new to the collection and others new to Costa Rica.) (Gift.)

———. 1 specimen of *Chriomachœris aurantiaca*, from Costa Rica. A species new to the fauna of that country. (Gift.)

(*b*) *Nests and eggs.*

The number of entries made in the oological register during 1884 was 3,222 (Museum Nos. 18,922–22,143), much the largest part of which consisted of Captain Bendire's magnificent collection of North American birds' eggs, numbering nearly 8,000 specimens, generously presented by Captain Bendire to the National Museum, and catalogued and arranged under his direct supervision. The more important of other accessions are the following:

Fencker, Governor, Gothaab, Greenland: 25 entries, same number of species, from Greenland.

Merrill, Dr. James C., U. S. A.: 468 entries, 243 species, from various localities.

Nelson, E. W., Tucson, Ariz.: 156 entries, 75 species, from Arizona.

Ray, Lieut. P. H., U. S. A.: 123 entries, 14 species, from Point Barrow, Alaska.

Smith, Hugh M., Washington, D. C.: Nest and eggs of American Goldfinch (*Chrysomitris tristis*), from Virginia.

Stejneger, Dr. Leonhard, U. S. Signal Service: 58 entries, 34 species, from Bering Island, Kamtschatka.

Townsend, Charles H.: 27 entries, 11 species, from Red Bluff, California.

Turner, Lucien M., U. S. Signal Service: 2 entries, same number of of species, from Alaska.

DISTRIBUTION OF SPECIMENS.

The total number of specimens distributed during 1884 was 2,658 birds and 45 eggs, as follows:

(*a*) *Skins.*

Specimens sent out in exchange	2,244
Specimens loaned for examination	414
Total	2,658
Species sent out in exchange	1,025
Species loaned for examination	113
	1,138

(*b*) *Eggs*.

Specimens sent out in exchange	34
Specimens loaned for examination	11
Total	45
Species sent out in exchange	11
Species loaned for examination	11
Total	22

SPECIAL WORK ACCOMPLISHED.

Unpacking and redistributing the collection of birds sent to the London International Fisheries Exhibition.—The return of several large boxes of specimens of aquatic and fish-eating birds, sent to the London International Fisheries Exhibition, necessitated a large amount of labor in unpacking and redistributing the same to their respective drawers. This collection embraced 380 specimens, representing 220 species.

Selection of birds for the museum of the Indiana State University.—The natural history collections of the Indiana State University having been totally destroyed by fire in July, 1883, the National Museum undertook to replace, in a measure, the ornithological collection of that establishment. For this purpose a considerable number of duplicate mounted specimens were available, and in order to get at these it was necessary to unpack some dozen or more large boxes which had been kept in the storage rooms, and then repack and invoice the residue. The total number of specimens, chiefly mounted, which were thus disposed of amounted to 564, representing 395 species.

Researches connected with a new list of North American birds.—The curator of the department having been charged by the Committee on Classification and Nomenclature of the American Ornithologists' Union to determine certain doubtful questions of synonymy among North American birds, for the proposed new list to be published by the Union, he has spent much time in investigating the various complicated questions pertaining to this work. In this labor he has been materially assisted by Dr. Leonhard Stejneger.

Rearrangement of the collection of larger water birds, &c.—Four new large "Salvin" cabinets having been provided for the accommodation of a portion of the collection of larger birds; the latter, which had been packed in various inconvenient and unsafe receptacles, chiefly large packing boxes, were unpacked and rearranged in the drawers of the new cabinets.

Installation of mounted specimens.—A large number of specimens which had accumulated during the occupancy of the alcoves between the exhibition cases in the main hall by the Smithsonian offices, while the east end of the building was undergoing repairs, was distributed through the cases after the alcoves were cleared, it having until then been impossible to gain access to the cases.

Moving the office of the curator.—The former quarters of the curator in the top of the south tower proving, under the large increase of business in the department, no longer suitable for the purpose, the southwest gallery of the main hall was, at the curator's suggestion, cleared and fitted up for temporary occupancy. The labor of moving the furniture, &c., of the curator's office to the new quarters was very considerable, involving, among other things, the transfer of 27 quarter-unit cases and 11 walnut cabinets, with their contents (embracing some 30,000 specimens).

Selection of specimens for mounting.—About 2,500 skins were selected for mounting, to add to the exhibition series of the Museum. Of this number somewhat over 1,200, chiefly small birds, were mounted; but the remainder are put aside to be mounted as opportunity permits.

Preparation of copy for labels for the exhibition collection.—Copy for considerably over 1,000 species-labels for the mounted birds was prepared during the year, said labels to give the English name (in large, heavy type) of each species, the various local or popular names, the scientific name, the range, a reference to where a full account of the habits, etc., can be found, and other information specially desired by the general public. All the North American and a considerable number of the foreign species have been thus covered. A sample copy of this label is herewith submitted:

RING-BILLED GULL.

Larus delawarensis, ORD.

Water B. N. Am., I. p. 244.

Whole of North America, breeding northward; south, in winter, to Mexico and Cuba.

669.

Transfer of mounted specimens to new walnut stands.—Several hundred of the mounted specimens were during the year transferred to new black-walnut stands, and the beauty of the collection thus materially increased.

New Orleans exhibit.—By far the larger part of the work done from July to November, inclusive, consisted in the preparation of an exhibit of birds for the World's International Cotton Exposition at New Orleans. It was at first intended to send a selected series of birds from all parts of the world, in order to show the more characteristic types of each of the primary zoögeographical divisions of the earth. This plan was, however, found not feasible, owing partly to the large expense involved in the purchase of specimens not already in the collection, but chiefly to the lack of sufficient space in the exhibition building. It was finally determined, therefore, to restrict the exhibit to a collection of North American game-birds, of which 171 specimens (a large number of them mounted specially for the occasion), representing 123 species, were sent. These were installed by Dr. L. Stejneger, assistant curator. This collection embraces, with a few unimportant exceptions, all the North American species of the turkey, grouse, and partridge families, besides all the species of swans, geese, and ducks, shore-birds, &c., of Eastern North America, all accurately labeled with both their English and scientific names.

Publications.—The total number of papers published during 1884 which were based exclusively or in part on the bird collection of the National Museum is 60, embracing about 450 octavo pages, and of books, 3 volumes, two royal 8vo, with a total of 1,096 pages, and one imperial octavo of 893 pages.

PRESENT STATE OF THE COLLECTION.

(*a*) *Mounted and alcoholic specimens and skins.*

Condition.—In all respects except the manner of installation of the exhibition series, and some inconveniences of arrangement resulting from insufficient storage facilities, the present condition of the collection is excellent. No injury has been done by insects, owing in part to the tight-fitting cases in which the principal part of the skin collection is kept and to the close surveillance kept over those specimens to which insects could gain access. Bisulphide of carbon has been freely used in all the drawers, close-fitting and otherwise, and any infected specimens discovered were at once quarantined and fumigated. The collection is in very urgent need of better accommodations, however, as is more fully explained under the head of "Recommendations."

Extent.—It was found impracticable to make an actual inventory of the collections at the end of 1884, on account of the pressure of numerous other duties. But the following estimate, based on the inventory for 1883 and the number of specimens received and distributed during the past year, may be considered as approximately correct:

	Specimens.
Reserve skin series	32,550
Exhibition series	6,800
Duplicate series	9,350
Alcoholic series	1,650
Total	50,350

The reserve series, exclusive of alcoholics, consisted therefore of about 39,350 specimens at the end of 1884.

(*b*) *Oological collection.*

The collection of birds' eggs has been completely overhauled and rearranged during the year by Capt. Charles E. Bendire, U. S. A., assisted by Mr. C. W. Beckham and Miss Harriet S. Perkins. Captain

Bendire presented to the National Museum his unique collection of North American birds' eggs, numbering nearly 8,000 beautifully prepared specimens, representing unrivaled series of many very rare species, besides a number not previously represented in the Museum. This valuable collection was incorporated with that of the Museum, the two thus combined being entirely rearranged after the sequence of species given in the latest edition of the "Smithsonian" catalogue of North American birds (Bulletin U. S. National Museum, No. 21), and neatly packed in glass-topped drawers, between strips of cotton batting. The collection is arranged in 5 unit cases and 154 drawers, besides various other temporary receptacles.

A complete census of the egg collection has been made by Miss Perkins, assisted by Mr. Hugh M. Smith. The total number of eggs, exclusive of those in nests, which were not counted, is 40,072, distributed as follows:

North American reserve series	24,483
North American duplicate series	11,317
Total North American	35,800
Palæarctic reserve series	2,536
Neotropical reserve series	1,211
Miscellaneous foreign series	190
Kerguelen Island series	104
Foreign duplicate series	231
Total foreign collection	4,272
	35,800
Grand total	40,072

RECOMMENDATIONS.

Cases for the exhibition series.—By far the most urgent need of the department of birds is the want of suitable cases for the arrangement of the exhibition collection. The main purpose of this collection being the entertainment and instruction of the general public, it is due the latter that this, to them most important, portion of the collections should be exhibited in a manner which will afford them the means of deriving both pleasure and instruction from its inspection. In its present condition the exhibition series of birds is not only not in keeping with the dignity of the National Museum, but it is actually and deservedly the subject of much unfavorable comment. With the cases at present provided it is not possible to arrange the collection in any attractive manner, even were the number of cases sufficient for its accommodation. The American Museum of Natural History in New York City is able, on account of its large, well-lighted, and admirably constructed cases, to make a display of the most diversified forms of the feathered creation, with which the bird exhibit of the National Museum cannot be compared, except to its discredit. I would most earnestly recommend that the evil be remedied at as early a date as practicable by the construction of new cases or the repair and modification of those now in use. The National Museum possesses material, in the form of beautifully mounted specimens and unmounted skins, from which in a short time could be built a collection for popular instruction far superior to any in America, and for beauty and utility, if not in extent, unsurpassed by any in Europe.

Labels for the exhibition collection.—Next to the evil discussed above is the absence of suitable labels for the specimens in the exhibition series. All are provided with the usual Museum label, upon which is recorded in full the data pertaining to each. But these labels, even when not fastened beneath the stands, are of no use to the public. The latter require a label upon which they may find in conspicuous typography the name of the bird before them (particularly its English name, if the species have one) and other similar facts. To meet this requirement a form of label has been invented by the curator upon which is printed, first, in large, heavy-face type, the English name of the species; second, in smaller type, the various popular or local names by which it is known; third, in medium heavy-face type, the scientific name; and, fourth, a condensed statement of the range or habitat. In the case of species having notable characteristics or of special economic importance, the facts are briefly but concisely mentioned. The copy for labels for all the species of North American birds is completed, ready for the printer, as is also that for a large number of exotic species, and I would earnestly recommend that these be printed as soon as practicable. (See sample label exhibited on page 151 of this report.)

Transfer of mounted specimens to new stands.—Most of the larger birds in the mounted collection have been transferred to new walnut stands of the adopted model; but there still remains a considerable number, and much the greater part of the smaller specimens, which are yet on the old stands or on rough ones improvised for temporary use by the taxidermist. A sufficient number of new stands is on hand for the specimens which are yet to be transferred, and I would respectfully recommend that the completion of the work be assigned to some competent person, under the direction and supervision of the curator.

Taxidermist's laboratory.—The laboratory of the taxidermist is at present in need of many repairs and fixtures for facilitating the work of mounting birds for the exhibition series. Wall-cases with sash-doors and shelves are needed, as are also other improvements which it is unnecessary to specify here.

Additional storage room for specimens.—The bulk of the collection of birds has increased to such an extent that the cabinets thus far provided are crowded to the utmost limit of their capacity, and specimens accumulate so fast that the question of their accommodation is a serious one. At least three more of the large "Salvin" cabinets are urgently needed for the larger birds, and an equal number of quarter-unit cases for smaller specimens.

Additions to the exhibition series.—The exhibition series being intended for the purpose of popular instruction, it is therefore obvious that a judicious selection of the objects to be exhibited is highly desirable. No end is served by the presentation of many species of one family of birds, or a large number which appeal in no way to the interest of the general public. Apart from the North American collection, which, in the interest of students, should be made complete as possible, the exhibition collection should consist of birds remarkable for beauty of plumage or peculiarities of structure, or interesting from their association with literature or history, or from their economic value. During a recent inspection of the American Museum of Natural History in New York City, the curator made a list of more than 100 species of foreign birds which constitute the chief attraction of that superb museum, all of which are wanting to the national collection. There are also required for the purposes of scientific research many forms which can be obtained only by purchase, the want of which has greatly impeded the scientific work of those who have made the collections of the National Museum the basis of their scientific investigations. It is earnestly recommended, therefore, that these species (a list which the curator hopes shortly to present) be purchased as soon as the finances of the Museum will allow.

Ornithological library.— Not less pressing than the acquisition of special desiderata in the way of specimens is the need of a better working library for the Department of Birds. There are many books, some of which are in almost every public library of importance in the country, and even in not a few private libraries—but not in that of the National Museum or of Congress—which are indispensable to the working ornithologist. These should be supplied at as early a date as possible.

Additional assistants.—The work of the department has increased so rapidly within the last few years, that with his present force the curator cannot keep abreast of his duties as they accumulate and at the same time carry on the improvements in the condition of the collection which are necessary to its preservation and utility. Two additional aids are needed, both of whom should be persons who would have a lively interest in their work, one to act as messenger and general assistant, the other to perform necessary clerical duties.

VI.—REPORT UPON THE DEPARTMENT OF HERPETOLOGY IN THE U. S. NATIONAL MUSEUM FOR THE YEAR 1884.

By H. C. YARROW, M. D., *Honorary Curator.*

During the past year, as in previous years, the Department of Reptiles has been abundantly favored by many contributors whose interest in herpetology has led them to make valuable and extensive collections, and both the reserve and general series have been consequently much enlarged and made more valuable for purposes of comparison and study.

Among the most noteworthy of the donations received may be mentioned the following: From Capt. Charles Bendire, U. S. A., who for many years has been a most devoted friend to the establishment, has been received a large and valuable collection from Fort Klamath and vicinity, Washington Territory. Mr. Charles H. Townsend, of Baird, Shasta County, California, has sent in an extremely interesting collection of the characteristic reptiles of that vicinity. Mr. C. J. Hering, of Surinam, a large contributor in previous years, has also presented a valuable collection of exotic reptiles, and from the scientific gentlemen of the Fish Commission steamer, Albatross, a large collection made during the cruise in the West Indies in 1884, comprising over one hundred specimens, has been received. This collection has been loaned, by direction of Professor Baird, to Prof. E. D. Cope, of Philadelphia, for study and identification; the results will be probably embodied in a forthcoming paper by this distinguished naturalist on tropical herpetology. From Lieut. George F. Chase, U. S. A., Fort Thomas, Arizona, have been received two living examples of the "Gila monster," *Heloderma suspectum*, Cope, these having been sent by special request to furnish additional material for Dr. S. Weir Mitchell's researches upon the venom of this interesting lizard. Collections have also been received from R. Ellsworth Call, Des Moines, Iowa, and a particularly valuable one from E. W. Nelson, Tucson, Arizona.

During the months of August and September, 1884, the curator, being in charge of a small party for scientific research sent out by direction of the Secretary of War, had an opportunity of collecting many valuable and interesting specimens of reptiles in the Territory of Utah, supplementing in this manner the collections made by him in 1872 while naturalist of Lieutenant Wheeler's expedition. By permission of the

Director of the Museum one of his assistants in the Department of Reptiles accompanied him, and by permission of General McCook, U. S. A., Lieut. B. W. Atkinson, Sixth United States Infantry, also joined the party; both gentlemen rendered valuable assistance. A small appropriation was made to further the objects of the expedition.

Other collections have been received from José C. Zelodon, of Costa Rica; B. V. Archer, Key West, Fla.; Prof. D. S. Jordan, Bloomington, Ind.; Dr. B. G. Lartigue, of South Carolina; Miss Rosa Smith, San Diego, Cal.; James Bell, Gainesville, Fla.; John and Charles Walker, Olney, Richland County, Illinois; H. C. Orcutt, San Diego, Cal.; R. E. C. Stearns, Auburn, Cal.; F. W. Hayden, Canada; Gustave Kohn, New Orleans, La.; W. A. Conklin, superintendent Central Park Museum, New York; J. Richardson, Rutland, Vt.; D. S. Sheldon, Griswold College, Davenport, Iowa; Charles R. Orcutt, San Diego, Cal.; Charles H. Townsend, Red Bluff, Cal.; H. W. Turner, San Francisco, Cal.; Maj. G. E. Dobson, Surgeon Royal Victoria Hospital, Netley, England; H. W. Henshaw, Massachusetts; and R. Ridgway, Wheatland, Ind. From this extended list it will be seen that the public interest in the Reptile Department is constantly increasing. We are also under great obligations to Professor Snow, of the Kansas University, who loaned us a unique and beautiful specimen of *Crotalus lepidus*, which has been drawn as one of the illustrations for the Manual of Herpetology in course of preparation by the curator.

As was mentioned by the curator in his last annual report, the routine work of the department has been transacted by himself and two assistants, both of whom are already possessed of considerable knowledge regarding reptiles. The ordinary routine is as follows: All collections received are at once numbered with a metallic tag and entered in the accession book, having been previously identified if possible. They are then, after a careful examination, placed in either the reserve or the general series, an additional record being made, in order that in case a specimen is needed it may be at once found according to its classification. In explanation of the terms "reserve series" and "general series" it may be said that the entire collection of American reptiles is divided into two great parts, one called the "Reserve Series," intended for purposes of study and comparison, and from which is selected the exhibition set, the other entitled the "General Series," from which selections are made for donations to other museums or to amplify the "Reserve Series." It is to be greatly regretted that proper space is not available to admit of a proper display of series of both domestic and foreign reptiles.

It has long been the intention of the curator to arrange in the same manner the collection of foreign reptiles, but in the present crowded condition of the curator's room it has been found impossible to do this properly.

The following records, in addition to the current record, are kept with great care and exactitude, and are necessitated by the business of the department, which has greatly increased in magnitude during the last five years. These records are as follows:

Record of reserve series.
Record of general series.
Record of letters received.
Record of letters sent.
Record of requisitions.

In these may be found every matter of business transacted in the Department of Reptiles.

No little labor is involved in attending promply to the official correspondence, which is quite voluminous at times, for letters of inquiry are received from all parts of the world, to answer which, require much study, thought, and labor. During the year 1884 over two hundred letters were received and answered, and many were written in addition.

The long-cherished desire of the curator to have prepared a card-catalogue of the collection of reptiles is now in a fair way toward realization, as a commencement has been made and over a thousand specimens have been examined, verified, and recorded. This, in view of the regular work, which was arduous in 1884, is considered a good beginning.

The manuscript of a Manual of Herpetology (mentioned in last year's report) by the curator, could be put into the hands of the printer within a short period if the illustrations were all completed. Owing to a want of funds, further work upon these has been stopped.

No special work has been attempted this year apart from the routine duties and field researches.

At the present time the collection is in excellent condition, which could be much improved were more space available. Although since December 1, 1884, the business of the Reptile Department has been closed by the furloughing of both assistants, still constant attention is given in order that the specimens may not perish for want of suitable care.

Number of specimens on hand:

In reserve series	8,926
In general series	8,819
Exhibition set (selected for):	
Domestic	600
Foreign	150
Not classified and exotic specimens, probably	5,000
Total	23,495

Total number of entries in record book, 1884	584
Total number of specimens received to January 1, 1885	1,494
Total number of entries in record up to January 1, 1885	14,329

Since his connection with the National Museum, in an honorary capacity, the curator has repeatedly called attention to the fact that without additional accommodation for his department it would be impossible to so arrange the collection as to make it of much practical value, and it is now with a desponding spirit that he again urges that something may be done for relief. All the available shelf-space is overcrowded, specimens have to be placed on the floor or in an adjoining hall, and much material that is valuable is hidden away in clumsy tanks, deposited in almost inaccessible corners.

Owing to other and important official duties, it is impossible for the curator to give his entire time to reptilian work, and without assistance the department will gradually merge into the condition it was when he first took charge of it. With becoming deference he thinks this should not be permitted; an enormous amount of work has been expended in the department, and, with pardonable pride, he thinks that under the circumstances it compares most favorably with any of the other departments in the National Museum.

It must be conceded by all who have looked into this subject that the Reptile Department is of quite as much importance to the Museum and to the scientific public as any of the other departments, and for this reason the curator again respectfully calls the attention of the Director to his recommendation of last year, that the person in charge should be a salaried officer, and be required to give his entire time to the duties of his office. This the present curator cannot do, and it will therefore be understood that no motive of self-interest prompts him in this suggestion.

REPORT UPON THE DEPARTMENT OF FISHES IN THE U. S. NATIONAL MUSEUM FOR 1884.

By TARLETON H. BEAN, *Curator.*

IMPORTANT ACCESSIONS DURING 1884.

There were 93 accessions during the year, of which 51 were gifts, 32 from Museum collectors, and 10 from U. S. Fish Commission collectors.

SYNOPSIS OF THE ACCESSIONS.

Alabama	2	Missouri	3
Arkansas	1	New Hampshire	2
California	3	New Jersey	3
Delaware	2	New Mexico	1
District of Columbia	9	New York	6
Florida	6	North Carolina	2
Georgia	2	Oregon	8
Illinois	1	Pennsylvania	1
Indiana	1	Rhode Island	2
Iowa	1	Texas	4
Kansas	1	Virginia	4
Maryland	2	Washington Territory	2
Massachusetts	7	Wisconsin	1
Michigan	2	Deep sea	2
Mississippi	2		

EXTRALIMITAL.

Alaska	1	Manitoba	1
Chili	1	Newfoundland	1
Curaçao	1	Ontario	1
England	1	Peru	1
Greenland	2	Quebec	2
Japan	1	Venice	1
Labrador	1	West Indies	4

By addition we would have a larger number of accessions than 93; but, in some cases, the accession was partly from one locality and partly from another, and each is credited as one in the synopsis.

Following is a summary of the most interesting accessions catalogued during the year, 34 in number:

Capt. Charles Bendire, Fort Klamath, Washington Territory. Accession 13916; catalogue, 33956–33957. This collection contained two very large skins of *Catostomus labiatus*, a little known sucker, and one which we have not had in the Museum before.

L. M. Turner, Ungava Bay, Labrador. Accessions 13724 and 13922; catalogue 34114–34261. This large and valuable collection of fishes was made in 1882 and 1883, by Mr. Turner. It contains twenty-seven species, represented in most cases by a sufficient number of excellent specimens. As might have been expected, his collection is rich in *Salmonoids*, including six species. One of the most interesting of the species is a char, which I suppose to be *Salvelinus stagnalis;* this is remarkable for its enormous size, almost rivaling that of the Maine salmon. Among the rarer species obtained by Mr. Turner are the following: *Cottus scorpioides*, *Cyclopterus spinosus*, *Stichæus punctatus*, and *Somniosus microcephalus.*

Prof. D. S. Jordan, Bloomington, Ind. Accession 13981; catalogue 34351–34373. This is a collection of Venetian fishes, containing twenty-three species.

Daniel Kelleher, New Bedford, Mass. Accession 14058; catalogue 34380. A stuffed skin of *Conger*, 65 inches long.

South Side Club, Oakdale, L. I. Accession 14060; catalogue 34382. A fresh specimen of the rainbow trout, *Salmo irideus*, which was reared in the ponds of the club, and shows remarkable growth of the species since its introduction there by the U. S. Fish Commission.

Miss Rosa Smith, San Diego, Cal. Accession 14099; catalogue 34745–34792. A fine collection of about thirty-seven species of Pacific fishes.

E. G. Blackford, 80 Fulton Market, New York, N. Y. Accession 14151; catalogue 34427. A male steel-head trout, *Salmo gairdneri*, weighing 26 pounds, from Portland, Oreg.

Dr. William H. Jones, U. S. N., U. S. S. Wachusett. Accession, 14202. Nine jars of fishes in alcohol, collected during the cruise of the U. S. S. Wachusett. Coast of Peru.

George A. Hudson, Savannah, Ga. Accession 14280; catalogue 34715. A leather carp, *Cyprinus carpio*, from the Ogechee River, Georgia. Weight, 2½ pounds.

A. Booth, Chicago, Ill. Accession 14296; catalogue 34743. A shad, *Clupea sapidissima*, from the Columbia River.

Walter Haydon, Weston, Ontario. Accession 14306; catalogue 34821–34831. Ten species of fishes from Hudson's Bay, as follows: *Perca americana*, *Cottus labradoricus*, *Uranidea spilota*, *Esox lucius*, *Percopsis guttatus*, *Catostomus longirostris*, *Salvelinus fontinalis*, *Stizostedium vitreum*, *Coregonus labradoricus*, *Coregonus artedi* var.

E. G. Blackford, 80 Fulton Market, New York, N. Y. Accession 14311. A halibut weighing 430 pounds, from Newfoundland. This specimen was cast and skinned.

S. J. Martin, Gloucester, Mass. Accession 14417; catalogue 34883. A specimen of the black grouper, *Epinephelus nigritus*, weighing 300 pounds. Captured off Block Island. This is a species belonging to our southern coast; it strayed out of its native waters.

E. G. Blackford, 80 Fulton Market, New York, N. Y. Accession 14480; catalogue 34884. A pompano, *Trachynotus goreensis*, weighing 36 pounds.

Prof. D. S. Jordan, Bloomington, Ind. Accession 14486; catalogue, ——. A large collection of fishes from Cuba and Florida, containing many new species.

U. S. Fish Commission Steamer Albatross. Accession 14286; catalogue 34853–34881, 34887–34903, 34905–34963. A tank of fishes from Saint Thomas, Trinidad, Curaçao, and Key West, Fla.

Prof. C. H. Gilbert, Rockford, Ill. Accession 14525; catalogue 34979–34983. A small collection of Illinois fishes, containing types of the following new species: *Nocomis hyostomus*, *Notropis boops*, and *Pœcilichthys palustris*.

Capt. T. W. Sumpter, Big Spring, Va. Accession 14523; catalogue 34978. A rainbow trout, *Salmo irideus*, taken in Roanoke River, June 13, 1884.

E. C. Smith, Newport, R. I. Accession 14543; catalogue 34988. A specimen of *Chætodipterus faber*, caught at Newport. An unusual species in that locality.

Capt. George A. Johnson, Gloucester, Mass. Accession 14589; catalogue 35110. A specimen of *Chiasmodus niger*, from Brown's Bank. Captain Johnson says it was taken alive, and was very ferocious.

J. Dock Harrell, Osyka, Miss. Accession 14606; catalogue 35144. A specimen of striped bass, *Roccus septentrionalis*, which species is now reported in large schools of varying sized fish in that part of the Lower Mississippi Valley.

Prof. S. F. Baird, Wood's Holl, Mass. Accession 14614; catalogue 35136. A specimen of the frigate mackerel, *Auxis rochei*.

Frank G. Galbraith, Wrightsville, York County, Pennsylvania. Accession 14624; catalogue 35137. A mirror carp, *Cyprinus carpio*, 19 inches long, taken in the Susquehanna River.

U. S. Fish Commission, Wood's Holl, Mass. Accession 14759; catalogue ——. Fifteen bottles of the rarer deep-sea fishes obtained by the Albatross.

Prof. D. S. Jordan, Bloomington, Ind. Accession 14828. A large collection of fresh-water fishes from Iowa and Missouri, containing many new and rare species.

Prof. D. S. Jordan, Bloomington, Ind. Accession 14881. Fresh-water fishes from Southern Missouri, Kansas, Arkansas, Indian Territory, Indiana, and elsewhere. In this and the preceding lot there are about twenty-five new species and a hundred desiderata.

J. A. Duguo ?, Gloucester, Mass. Accession 14965; catalogue 36601. A specimen of *Trachypterus arcticus* from Iceland.

Prof. D. S. Jordan, Bloomington, Ind. Accessions 15002 and 15011; catalogue ———. Numerous species of fishes from Indiana and Texas, *Dr. T. H. Bean, U. S. National Museum, Washington, D. C.* Accession 15031. Sixty-three species of marine and fresh-water fishes from Great South Bay, Long Island, and vicinity.

Prof. C. H. Gilbert, Bloomington, Ind. Accession 15056. A box of fishes from Alabama, including new species of darters, minnows, catfishes, &c.

E. S. Stover, Albuquerque, N. Mex. Accession 15114; catalogue 36891. Six specimens of carp, *Cyprinus carpio*, raised in alkali water.

James G. Swan, Port Townsend, Wash. Accession 15152; catalogue ———. This collection includes, among other things, a beautiful example of *Chirolophus polyactocephalus*, Pallas, which has not been known south of Alaska before.

Peter Smith, Chaptico, Saint Mary's County, Maryland. Accession 15412; catalogue 36919. A mirror carp, *Cyprinus carpio*, weighing 11 pounds, which was caught in Wicomico Bay, in brackish water.

Dr. W. H. Jones, U. S. S. Wachusett, Callao, Peru. Accession 15224; catalogue 36928–36934. A small collection of marine fishes containing a *Trachurus*, a *Scomber*, a *Sciæna*, an *Ophichthys*, and several remarkably large *Gobiesox*, measuring about a foot in length.

ENTRIES IN THE CATALOGUE OF FISHES DURING 1884.

The total number of entries in the catalogue was 3,015, the first entry being 33920 and the last 36934.

This number was distributed through the different months as shown in a table further on.

Table showing some of the work upon the collection of fishes during 1884.

Months.	Lots of fish received.	Lots of fish catalogued.	Packages sent out.	Fish drawings examined.*
January	5	454	1	5
February	6	23	7	8
March	6	313	5	11
April	10	85	1	6
May	10	189	3	13
June	16	226	7	17
July	9	216	11	7
August	11	200	8	10
September	2	....	....	8
October	10	1,357	1	17
November	8	27	5	10
December	5	25	5	5
Total	98	3,015	54	117

* Ten drawings, made by Miss Smith, not included here.

WORK DONE UPON THE FISHES DURING 1884.

The notes on fishes, made by me while in Europe, in 1883, were arranged for the printer.

A large and valuable collection of fishes, received from J. C. Brevoort through E. G. Blackford, were identified and catalogued.

A collection of Jamaican fishes, including nearly one hundred species, sent here in duplicate for identification, by the Kingston Public Museum of Jamaica, was attended to. This is an important accession to the collection of fishes.

The fresh-water fishes were all removed to the west basement, where Prof. D. S. Jordan, during the months of July and August, worked over the entire collection, verifying the old identifications and re-arranging the collections generally. Many of these fishes were found to be absolutely worthless, and consequently were thrown away.

A journal relating to the fishes of Wood's Holl, Mass., and vicinity, kept by Mr. V. N. Edwards, from 1872 to 1880, is being revised for publication.

The large accessions required considerable attention, especially those from the deep sea. On account of the large number of gifts numerous lists were made for the donors and other information concerning the fishes was furnished.

During the months of July and August my time was mostly taken up with editorial work.

I left Washington for Patchogue, Great South Bay, N. Y., with two of my assistants, Messrs. Bean and Dresel, on the 2d of September. We spent about six weeks collecting fishes, principally marine species, in Great South Bay and the ponds in the vicinity of Patchogue.

The work upon the bottled collection of marine fishes was commenced, and the different series will be made up as rapidly as possible.

FISH DRAWINGS COMPLETED BY MISS M. M. SMITH, 1884.

Erimyzon goodei. Lateral view.
838. *Ichthælurus furcatus.* Lateral, head from above, and ventral views.
35631. *Chimærid.* Lateral, head from above, and ventral views.
35415. *Psenes.* Lateral view.
35634. *Alepoccphalid ?* Lateral view.
35559. *Alepocephalid ?* Lateral view.
35540. *Astronesthes richardsonii.* Lateral view.
35635. *Bathypterois.* Lateral view.
35625. *Brotulid.* Lateral view.
33958. *Coregonus artedi.* Lateral view.

LIST OF THE FISHES DRAWN BY MR. H. L. TODD DURING 1884.

January:
32888. *Catostomus longirostrum.* Lateral and ventral views.
16633. *Salmo pleuriticus.* Lateral view.
30176. *Trachynotus glaucus.* Lateral view.
29882. *Physiculus.* Lateral view.
31917. *Epinephelus drummond-hayi.* Lateral view.

February:
Pristis pectinatus. Lateral view.
27657. *Ophiodon elongatus*. Lateral view.
Mola rotunda. Lateral view. From cast.
17113. *Bothus maculatus*. Lateral view.
17800. *Minytrema melanops*. Lateral view.
31482. *Pomacanthus zonipectus*. Lateral view.
33197. *Pomacanthus arcuatus* (ad.). Lateral view.
26564. *Calamus pennatula*. Lateral view.

March:
33189. *Anisotremus virginicus*. Lateral view.
34397. *Alutera scripta*. Lateral view.
13087. *Blepharis crinitus*. Lateral view.
16252. *Vomer setipinnis*. Lateral view.
33341. *Alepocephalus productus*. Lateral view.
Hemistoma guacamaia. Lateral view.
5815. *Xyrichthys vermiculatus*. Lateral view.
21500. *Citharichthys microstomus*. Lateral view.
26575. *Etropus crossotus*. Lateral view.
30862. *Paralichthys squamilentus*. Lateral view.
Scopelid. Lateral view.

April:
22832. *Menticirrus alburnus*. Lateral view.
26585. *Trachynotus ovatus*. Lateral view.
33220. *Lutjanus caxis*. Lateral view.
26583. *Ocyurus chrysurus*. Lateral view.
8247. *Hæmulon chromis*. Lateral view.
34742. *Oncorhynchus nerka*. Lateral view.

May:
34744. *Percina caprodes*. Lateral view.
30057. *Hæmulon fremebundum*.
23458. *Percina manitou*. Lateral view.
17869. *Diplesium blennioides*. Lateral view.
1813. *Pœcilichthys cœruleus*. Lateral view.
30243. *Boleosoma olmstedi*. Lateral view.
23459. *Alvordius crassus* (type). Lateral view.
26294. *Alvordius phoxocephalus*. Lateral view.
23460. *Boleichthys eos* (type). Lateral view.
27897. *Etheostoma flabellare*. Lateral view.
17852. *Imostoma shumardi*. Lateral view.
1281. *Etheostoma lineolatum*. Lateral view.
27212. *Torpedo californica*. Lateral, dorsal, and ventral views.

June:
23445. *Vaillantia camura*. Lateral view.
21994. *Pleurolepis asprellus*. Lateral view.

23454. *Nanostoma vincticeps*. Lateral view.
(CLXXIV.) *Benthosaurus grallator*. Lateral view.
34886. *Umbra pygmæa*. Lateral view.
34401. *Aphredoderus sayanus*. Lateral view.
With 21994. *Alvordius ?* Lateral view.
Malacosteus niger. Lateral view.
23461. *Rheocrypta copelandi* (type). Lateral view.
1164. *Alvordius macrocephalus*. Lateral view.
20354. *Mesogonistius chætodon*. Lateral view.
34957. *Hæmulon rimator*. Lateral view.
32095. *Eques lanceolatus*. Lateral view.
23456. *Pœcilichthys virgatus*. Lateral view.
23463. *Ioa vitrea*. Lateral view.
33915. *Emblemaria nivipes*. Lateral view.
(Station 2146.) *Diodon*. Lateral view.

July:

35035. *Hæmulon album*. Lateral view.
7987. *Ostracion trigonum*. Lateral view.
35135. *Tetrodon lævigatus*. Lateral view.
35136. *Auxis rochei*. Lateral view.
30824. *Chasmodes saburræ* (types). Lateral view.
30856. *Isesthes ionthas* (types). Lateral view.
35173. *Sparisoma cyanolene*. Lateral view.

August:

35081. *Diplodus unimaculatus*. Lateral view.
35086. *Myrophis*. Lateral view.
22821. *Polynemus octonemus*. Lateral view.
34896. *Aulostoma maculatum*. Lateral view.
30177. *Caranx amblyrhynchus*. Lateral view.
19907. *Centropomus undecimalis*. Lateral view.
22831. *Harengula pensacolæ*. Lateral view.
30071. *Clupea pseudohispanica*. Lateral view.
35042. *Calamus bajonado*. Lateral view.
35030. *Lutjanus analis*. Lateral view.

September:

35150. *Hæmulon tæniatum*. Lateral view.
Cryptotomus beryllinus. Lateral view.
35155. *Gobionellus oceanicus*. Lateral view.
3423. *Hypoplectrus nigricans*. Lateral view.
35021. *Epinephelus microlepis*. Lateral view.
30060. *Tetrodon testudineus*. Lateral and upper views.
35799. *Paralichthys ocellaris*. Lateral view.
3424. *Acanthurus chirurgus*. Lateral view.

October:
33181. *Echeneis naucrates.*
35168. *Platyglossus radiatus.*
36212. *Pœcilichthys punctulatus.*
36215. *Hadropterus cymatogrammus.*
35828. *Ammocrypta clara.*
36444. *Ammocrypta vivax.*
36523. *Microperca fonticola* (type).
1314. *Cottogaster putnami.*
35853. *Pœcilichthys gilberti.*
35946. *Anguilla.*
34004. *Nanostoma thalassinum.*
36442. *Etheostoma whipplei.*
36214. *Hadropterus nianguæ.*
36496. *Hadropterus evides.*
36446. *Hadropterus scierus.*
36139. *Etheostoma luteocinctum.*
35101. *Scorpæna grandicornis.*

November:
36448. *Etheostoma histrio.*
36413. *Cottogaster uranidea.*
34972. *Platophrys nebularis.*
36889. *Chirolophus polyactocephalus.*
35103. *Trisotropis venenosus.*
34447. *Antennarius annulatus.*
21903. *Limanda rostrata ?*
30143. *Chætodon capistratus.*
31975. *Anoplopoma fimbria.*
36911. *Cyprinus carpio.*

December:
36053. *Fundulus diaphanus.*
36052. *Fundulus heteroclitus.*
36020. *Gobiosoma alepidotum.*
35001. *Bœostoma inscriptus.*
36922. *Lutjanus synagris.*

During the year forty-one papers, based upon material belonging to the department, were published in the Proceedings for 1884.

PRESENT STATE OF THE COLLECTION.

The number of specimens now in the Museum is not definitely known, but it is estimated to be about 68,000, divided as follows: (1) In the reserve series, 36,000; (2) On exhibition, 20,000; (3) Duplicates about 12,000.

The condition of the collection has been greatly improved by transferring the fishes from old tanks into new ones and into glass jars.

There is, of course, some material which must be called distinctly bad, but the amount is becoming less and less every day.

RECOMMENDATIONS AND GENERAL REMARKS.

The duplicate fishes should be disposed of as soon as the sets can be made up.

There should also be some instructions to collectors, cautioning them against shipping large numbers of fishes belonging to well-known species.

Some provisions should be made for a proper storage of the skeletons of fishes, which are now lying in boxes, where they are inaccessible.

I take pleasure in referring again to the assistance which I have derived from the following-named gentlemen in my work upon the fishes: Mr. Barton A. Bean, Ensign H. G. Dresel, U. S. N., and Mr. Peter Parker, jr. Without the valuable help of these gentlemen much of the work which has been accomplished would have remained undone.

The Museum is to be congratulated also upon the addition to its corps of artists of Miss Mary M. Smith, of Bainbridge, Pa. Through the help of Mr. H. L. Todd and Miss Smith we are now able to produce very satisfactory illustrations of fishes.

I herewith append a statement, prepared by Prof. D. S. Jordan, regarding the collections of fishes made by himself under the auspices of the Smithsonian Institution, the Museum, and the Fish Commission. The collecting expedition of 1884 is of special value, being probably the most extensive yet undertaken in the fresh waters of the United States. The object of this exploration was the gathering together of a collection of fresh-water fishes to be exhibited by the National Museum at New Orleans.

A RECORD OF COLLECTIONS OF FISHES MADE UNDER THE AUSPICES OF THE U. S. FISH COMMISSION AND THE U. S. NATIONAL MUSEUM, FROM 1875 TO 1885.

By David S. Jordan.

For the past ten years the writer has been engaged in a special study of the distribution of fishes in the waters of North America. In this study he has had occasion to do a good deal of field work in the collection of and preservation of fishes. In this he has been aided by several students and associates, especially by Mr. Charles H. Gilbert, now professor of biology in the University of Cincinnati.

All this work has been carried on under the auspices of the U. S. National Museum and the U. S. Fish Commission. It has been performed, in a greater or less degree, under the direction of Professor Baird, and in all cases most of the material obtained, including the types of all new species, has been sent to the U. S. National Museum.

The amount of financial assistance received from Government sources has varied very much. At times (1880–'84) it has amounted to considerably more than the actual expenses of exploration and collection. At other times it has simply met the cost of the alcohol used. Aid of varying amount has also been given by Butler University and, since 1879, by the University of Indiana. These details are, however, foreign to the present purpose. I here give a brief account of the different excursions for field work in ichthyology, made by my associates and myself, with a list of the localities explored.

1875.

In the spring and fall of 1875, extensive collections were made in White River and its tributaries about Indianapolis, by the late Prof. Herbert E. Copeland and myself. A list of the species obtained is published in the Annals of the Lyceum of Natural History, of New York, 1877, pp. 375–377. Some collections were also made by Professor Copeland in Wisconsin and by myself at the Falls of the Ohio and about Cumberland Gap.

1876.

In the summer of 1876 I made an extended collecting tour in the Southern States, accompanied by Mr. Charles H. Gilbert, who was then a botanical student under Professor Copeland. A small collection was obtained in the Rock Castle River, at Livingston, Ky. About three weeks were spent by us at Rome, Ga. Here the streams tributary to the Etowah, Oostanaula, and Coosa Rivers were very thoroughly explored. A few days were also spent at Flat Shoals, on South River, a tributary of the Ocmulgee, southeast of Atlanta. Small collections were also made in Peach Tree Creek and in Nancy's Creek, tributaries of the Chattahoochee, near Atlanta.

This expedition represents the first attempt to study the fresh-water fishes of Georgia, and the collection then made is much larger than any since obtained in that State. The results of this summer's work have been published by me, under the title of "A Partial Synopsis of the Fishes of Upper Georgia," in the Annals of the Lyceum of Natural History of New York, XI, 1877, p. 307 *et seq.*

1877.

In 1877 a more extended tour in the Alleghany region of the Southern States was undertaken by the writer, with the assistance of Dr. Alembert W. Brayton and Mr. Gilbert. Numerous streams were examined, representing the following hydrographic basins: Santee, Savannah, Altamaha, Chattahoochee, Alabama, Tennessee, Cumberland. A detailed report of these explorations was published by Jordan and Brayton in Bulletin XII of the U. S. National Museum, 1878, under the title, "On the Distribution of the Fishes of the Alleghany Region of South

Carolina, Georgia, and Tennessee, with Descriptions of New or Little Known Species." An extended discussion of the distribution of fresh-water fishes is given in this paper, pp. 91–95.

1878.

In 1878 I spent some time at Beaufort, N. C., in the study of the marine fishes of that port. In my work here I was assisted by Dr. Brayton, Mr. Gilbert, and Mr. B. W. Evermann. A catalogue of the species obtained was published in the Proceedings of the U. S. National Museum, 1878, pp. 365–388, by Jordan and Gilbert, under the title of "Notes on the Fishes of Beaufort Harbor, North Carolina."

1879.

The summer of 1879 was spent in Europe. Considerable collections were made by Mr. Gilbert and myself at Venice.

1880.

In November, 1879, I was appointed special agent of the U. S. Census Bureau, in charge of the enumeration of the fisheries and other marine interests of the Pacific coast of the United States. I was also instructed by the U. S. Commissioner of Fisheries to undertake a thorough study of the fish-fauna of that region, and to make extensive collections of the fishes for distribution by the U. S. National Museum to the chief museums of the world.

Mr. Charles H. Gilbert was appointed assistant in this work. Special assistance in Puget Sound was rendered by Mr. James G. Swan, of Neah Bay, and about San Francisco by Mr. William N. Lockington, then of San Francisco. Important volunteer aid was also given by Miss Rosa Smith, of San Diego, by Mr. Charles J. Smith, then of Astoria, and by Capt. Andrea Larco, of Santa Barbara.

Mr. Gilbert and the writer reached San Diego about January 1, 1885. The time between that date and November 1 was devoted to an exploration of the coast from the Mexican boundary as far north as Saanich on Vancouver's Island, most of the important points being visited at least twice, at different seasons.

The chief points at which collections were made are San Diego, San Pedro (Wilmington), Santa Barbara, San Luis Obispo (Port Harford), Monterey, Soquel, San Francisco, Humboldt Bay, Astoria, Neah Bay, Seattle, Tacoma, Victoria, Saanich Arm, and New Westminster.

Few coasts have yet been so thoroughly explored, so far as the shore fishes are concerned. We had, however, no means of collecting fishes from any great depth. The results of these explorations have been given in numerous short papers in the Proceedings of the U. S. National Museum for 1880 and 1881, in the Synopsis of the Fishes of North America, and in other papers. Our reports to the U. S Census Bureau still remain unpublished. Some 55 species new to science were obtained by this expedition, and the number of species of shore fishes known from the Pacific coast of California, Oregon, and Washington was raised from about 200 to nearly 275. Series of specimens containing each from 50 to 250 of these species have been distributed to some 75 different museums, in various parts of the world.

The most important result of our work on the Pacific coast is probably the solution of the problem as to the number of species of salmon (*Oncorhynchus*) inhabiting the North Pacific. Similar results were reached at the same time by Dr. T. H. Bean, who was then carrying on explorations in Alaska.

On my return to the East I visited Utah Lake. Here, with the assistance of Peter Madsen, a fisherman at Provo, I made a considerable collection of fishes, some of them new to science. These have been described by Jordan and Gilbert in the Proceedings of the U. S. National Museum, 1880, 459.

After finishing his work in California in November, 1880, Mr. Gilbert continued his explorations southward, spending the winter at Mazatlan and Panama, returning from Colon to Washington in the spring of 1881. A remarkably rich and carefully preserved collection was obtained from the Pacific coast of Mexico and Central America. This included some 60 species new to science. These have been described in several papers by Jordan and Gilbert in the Proceedings of the U. S. National Museum and Bulletin of the U. S. Fish Commisson in 1881 and 1882. An elaborate paper containing synonymy and detailed descriptions of all the species of fishes known from the Pacific coast of tropical America was prepared by us for publication. This was destroyed by fire in 1883 when nearly ready for the press.

1881.

The summer of 1881 was spent in Europe. Collections were made in Genoa and Venice.

1882.

In the spring of 1882 I visited Galveston, New Orleans, and Pensacola, making a considerable collection at each point. The most important part of this collection was that obtained at Pensacola, with the assistance of Mr. Silas Stearns. The collections of fishes made by Mr. Stearns at Pensacola are among the most important which the National Museum has received from any source. The results of this expedition were published by Jordan and Gilbert in the Proceedings of the U. S. National Museum for 1882, pp. 241–307.

Part of the summer of the same year was spent by Professor Gilbert at Charleston, S. C. In his work here Professor Gilbert received important aid from Mr. Charles C. Leslie. The results of his explorations were published by Jordan and Gilbert in Proceedings of the U. S. National Museum, 1882, pp. 580–620.

1883.

The winter of 1882–'83 was spent by Professor Gilbert in making collections of fishes at Panama and at neighboring points on both sides of the Isthmus as well as in the fresh waters of the Isthmus and of Costa Rica. A large collection obtained was extremely rich in fresh-water forms and contained some 40 species new to science. It was unfortunately totally destroyed by the burning of the museum building of the Indiana University, July 12, 1883.

At this time about one-third of the collection previously made by Professor Gilbert at Mazatlan and Panama was also destroyed, as well as the private collections of Professor Gilbert and myself, which were very rich in the department of fishes. Nothing was published concerning these collections of 1883.

In the spring of 1883 a small collection of fishes was made in the Clear Fork of the Cumberland River by Mr. Joseph Swain and the writer. After the fire a third collection was made at Venice by Mr. Swain and myself. Small collections were also obtained at Wood's Holl, Mass., and in different streams of Indiana.

In November and December, 1883, I undertook a reconnaissance of the fish-fauna of the Florida Keys. A day was spent at Jacksonville, Fla., a few days at Cedar Keys, Fla., about three weeks at Key West, Fla., and nearly two weeks in Havana. In this work I was assisted by Mr. William H. Dye, a student of Indiana University. Large collections were obtained, especially at Key West and at Havana—upwards of 25 species being new to science. The collections made in Florida have been described in different papers in the Proceedings of the U. S. National Museum for 1884. Those from Havana have not yet been placed on record.

1884.

In July 1884 I was asked by Prof. G. Brown Goode, curator of the U. S. National Museum, to take charge of a series of explorations of the streams of the Southern States, to be undertaken in connection with the New Orleans Exposition. In this work I was assisted by Professor Gilbert, Prof. Joseph Swain, and Mr. Seth E. Meek.

Field work was begun early in July by Professors Gilbert and Swain in different streams in Indiana. Later they extended their explorations southward, making collections in the Rolling Fork, the Rock Castle, Cumberland, Clinch, French Broad, and Stone's Rivers; later in the tributaries of the Tennessee, about Florence, Tuscumbia, and Huntsville, in Alabama, and in those of the Black Warrior, about Cullman, Blount Springs, Warrior, and Tuscaloosa. This exploration of the Tennessee basin brought to light a number of new forms, especially in the group of *Etheostominæ*.

Meanwhile the writer, assisted by Mr. Seth E. Meek, began field work in the Des Moines River, in Southern Iowa. The Des Moines, Chariton, and Hundred and Two Rivers, in Iowa, were investigated, and the Missouri, La Mine, and Osage, in Missouri. After a time I was obliged to return to Indiana for a few days, and Professor Gilbert, with Mr. Meek's assistance, continued the work in tributaries of the Neosho, Osage, White, Niangua, and Gasconade, in Southern Missouri. I rejoined them at Eureka Springs, in Arkansas, where we made large collections in White River. Here Mr. Meek left us, and Mr. Gilbert and I proceeded to Fort Smith, where we made collections in Lee's Creek, the Poteau River, and the Arkansas. Proceeding southwestward from Little Rock, we explored in succession the Saline River at Benton, the Washita River at Arkadelphia, the Red River at Fulton, the Sabine River at Longview, the Trinity River at Dallas, the Lampasas and Leon Rivers at Belton, the Colorado River at Austin, the Rio Blanco and San Marcos Rivers at San Marcos, and the Rio Comal at New Braunfels. From New Braunfels we returned to Washington.

The explorations in 1884 are in several respects the most extensive yet undertaken in the fresh waters of the United States. As results of the summer's work a considerable number of new species have been added to our lists. The range of many species hitherto supposed to be rare and local has been greatly extended, and numerous species supposed to be well distinguished have been shown to be geographical varieties of others. We have been enabled in many cases to recognize subspecies among our fresh-water fishes and to properly distinguish these from individual and accidental variations. This work cannot be fully done until all our interior waters have been explored. There still remain many hydrographic basins in which no collections have yet been made.

RÉSUMÉ.

I give here a classified table of the principal localities at which collections have been made:

Marine.

Atlantic shores:
- Wood's Holl, Mass.
- Charleston, S. C. (Gilbert.)
- Beaufort, N. C. (Jordan, Gilbert, and Brayton.)
- Galveston, Tex.
- Pensacola, Fla. (Jordan and Stearns.)
- Cedar Key, Fla.
- Key West, Fla.
- Havana, Cuba.
- Colon (Aspinwall), United States of Colombia. (Gilbert.)

Pacific:
- Panama, United States of Colombia. (Gilbert.)
- Mazatlan, Mexico. (Gilbert.)

Pacific—Continued.
- San Diego, Cal. (Jordan and Gilbert.)
- San Pedro, Cal. (J. & G.)
- Santa Barbara, Cal. (J. & G.)
- San Luis Obispo, Cal. (J. & G.)
- Monterey, Cal. (J. & G.)
- Soquel, Cal. (J. & G.)
- San Francisco, Cal. (J. & G.)
- Tomales Bay, California. (J. & G.)
- Humboldt Bay, California. (Gilbert.)
- Astoria, Oreg. (Columbia River). (J. & G.)
- Neah Bay, Wash. (J. & G.)
- Seattle, Wash. (J. & G.)
- Tacoma, Wash. (J. & G.)
- Victoria, British Columbia. (J. & G.)
- Saanich Arm, British Columbia. (J. & G.)
- New Westminster, British Columbia (Fraser's River). (Gilbert.)

Fresh waters.

Great Lake Basin:
- Cayuga Lake, Ithaca, N. Y.
- East Coy Creek (Genesee River), Gainesville, N. Y.
- Lake Erie.
- Lake Michigan.
- Kantakee River, Riverside, Ind. (Gilbert.)
- Fox River, Appleton, Wis.
- Little Suamico River, Wisconsin.

Santee Basin:
- Ennoree River, Chick's Springs, S. C. (Jordan, Brayton, and Gilbert.)
- Reedy River, Greenville, S. C. (J., B. & G.)
- Saluda River, Tarr's Mills, S. C. (J., B. & G.)

Savannah Basin:
- Tugaloo River, Georgia. (J., B. & G.)
- Panther Creek, Georgia. (J., B. & G.)
- Toccoa Creek, Toccoa Falls, Ga. (J., B. & G.)

Altamaha Basin:
- Oconee River, Sulphur Springs, Ga. (B. & G.)
- South River (Ocmulgee), Flat Shoals, Ga. (J. & G.)

Chattahoochee Basin:
- Chattahoochee River, Shallow Ford, Gainesville, Ga.
- Suwanee River, Suwanee, Ga. (J., B. & G.)
- Peach Tree Creek, Atlanta, Ga. (J. & G.)
- Nancy's Creek, Atlanta, Ga. (J. & G.)

- Alabama Basin:
  - Etowah River, Rome, Ga. (J. & G.)
  - Silver Creek, Rome, Ga. (J. & G.)
  - Dyke's Creek, Rome, Ga. (J. & G.)
  - Oostanaula River, Rome, Ga. (J. & G.)
  - Rocky Creek, Floyd Springs, Ga. (J. & G.)
  - John's Creek, Floyd Springs, Ga. (J. & G.)
  - Lovejoy's Creek, Floyd Springs, Ga. (J. & G.)
  - Big Armuchee Creek, Rome, Ga. (J. & G.)
  - Big Dry Creek, Rome, Ga. (J. & G.)
  - Little Dry Creek, Rome, Ga. (J. & G.)
  - Waters' Creek, Rome, Ga. (J. & G.)
  - Lavender Creek, Texas Valley, Ga. (J. & G.)
  - Coosa River, Rome, Ga. (J. & G.)
  - Beech Creek, Rome, Ga. (J. & G.)
  - Horse-Leg Creek, Rome, Ga. (J. & G.)
  - Little Cedar Creek, Cave Springs, Ga. (J., B. & G.)
- Black Warrior Basin:
  - Black Warrior River, Warrior and Morris, Ala. (G. & S.)
  - Black Warrior River, Tuscaloosa, Ala. (G. & S.)
  - North River, Tuscaloosa, Ala. (G. & S.)
  - Eight-Mile Creek, Cullman, Ala. (G. & S.)
  - Cold Creek, Blount Springs, Ala. (G. & S.)
- Tennessee Basin:
  - Powell's River, Cumberland Gap, Tenn.
  - Indian Creek, Cumberland Gap, Tenn.
  - Clinch River, Clinton, Tenn. (G. & S.)
  - Bull Run, Bull Run, Tenn. (G. & S.)
  - Big Creek, Big Creek, Tenn. (G. & S.)
  - Big Pigeon River, Clifton, Tenn. (J. & G.)
  - French Broad River, Wolf Creek, Tenn. (G. & S.)
  - Wolf Creek, Wolf Creek, Tenn. (G. & S.)
  - Chickamauga River, Ringgold, Ga. (J., B. & G.)
  - Tennesee River, Florence, Ala. (G. & S.)
  - Big Cypress Creek, Florence, Ala. (G. & S.)
  - Little Cypress Creek, Florence, Ala. (G. & S.)
  - Big Shoal Creek, Florence, Ala. (G. & S.)
  - Sweetwater Creek, Florence, Ala. (G. & S.)
  - Spring Creek, Tuscumbia, Ala. (G. & S.)
  - Spring Branch, Huntsville, Ala. (G. & S.)
  - Elk River, Estill Springs, Tenn. (J., B. & G.)
  - Duck River, Columbia, Tenn. (G. & S.)
- Cumberland Basin:
  - Rock Castle River, Livingston, Ky. (J. & G., G. & S.)
  - Cumberland River, Williamsburg, Ky. (J. & S., G. & S.)

- Cumberland Basin—Continued.
  - Clear Fork of Cumberland, Pleasant View, Ky. (J. & S., G. & S.)
  - Wolf Creek, Pleasant View, Ky. (J. & S. & G. S.)
  - Stone's River, Murfreesboro', Tenn. (J., B. & G.)
  - Stone's River, Nashville, Tenn. (G. & S.)
  - Harpeth River, Franklin, Tenn. (G. & S.)
- Mississippi Basin:
  - Ohio River, New Albany, Ind. (G. & S.)
  - Rolling Fork, New Haven and New Market, Ky. (G. & S.)
  - White River (West Fork), Indianapolis, Ind. (J. & C., &c.)
  - Fall Creek, Indianapolis, Ind.
  - White River, Gosport, Ind.
  - Bean Blossom Creek, Bloomington, Ind.
  - White River (East Fork), Bedford, Ind.
  - Salt Creek, Nashville, Ind.
  - Clear Creek, Bloomington, Ind.
  - White River Swamps, Switz City, Ind. (Gilbert.)
  - Raccoon Creek, Mecca, Ind. (Gilbert.)
  - Wisconsin River, Dalles, Wis. (Copeland.)
  - Mississippi River, Burlington, Iowa. (Jordan & Meek.)
  - Des Moines River, Ottumwa, Iowa. (J. & M.)
  - Village Creek, Ottumwa, Iowa. (J. & M.)
  - Chariton River, Chariton, Iowa. (J. & M.)
  - Hundred and Two River, Bedford, Iowa. (J. & M.)
  - Hundred and Two River, Maryville, Mo. (J. & M.)
  - Missouri River, Saint Joseph, Mo. (J. & M.)
  - Tabo Creek, Lexington, Mo. (J. & M.)
  - Blackwater Creek, Brownsville, Mo. (J. & M.)
  - Flat Creek, Sedalia, Mo. (J. & M.)
  - Brown Springs (Creek), Sedalia, Mo. (J. & M.)
  - Tebo Creek, Calhoun, Mo. (J. & M.)
  - Grand River (Osage), Clinton, Mo. (J. & M.)
  - Sac River, Greenfield, Mo. (G. & M.)
  - Turnback Creek, Greenfield, Mo. (G. &. M.)
  - Osage Fork of Gasconade River, Marshfield, Mo. (G. & M.)
  - Niangua River, Marshfield, Mo. (G. & M.)
  - Spring River (Neosho), Carthage, Mo. (G. & M.)
  - White River (Narrows, Eureka Springs, Ark.). (J., G. & M.)
  - King's River, Eureka Springs, Ark. (J., G. & M.)
  - James Fork of White River, Marshfield, Mo. (G. & M.)
  - Arkansas River, Fort Smith, Ark. (J. & G.)
  - Poteau River, Slate Ford, Ind. T. (J. & G.)
  - Lee's Creek, Van Buren, Ark. (J. & G.)
  - Saline River, Benton, Ark. (J. & G.)
  - Washita River, Arkadelphia, Ark. (J. & G.)

Mississippi Basin—Continued.
  Red River, Fulton, Ark. (J. & G.)
  Mississippi River, New Orleans, La.

Sabine Basin:
  Sabine River, Longview, Tex. (J. & G.)

Trinity Basin:
  Trinity River, Dallas, Tex. (J. & G.)

Brazos Basin:
  Rio Lampasas, Belton, Tex. (J. & G.)
  Leon River, Belton, Tex. (J. & G.)

Colorado Basin:
  Rio Colorado, Austin, Tex. (J. & G.)
  Barton Spring and Creek, Austin, Tex. (J. & G.)

Guadalupe Basin:
  Rio Blanco, San Marcos, Tex. (J. & G.)
  Rio San Marcos, San Marcos, Tex. (J. & G.)
  Rio Comal, New Braunfels, Tex. (J. & G.)

Utah Basin:
  Utah Lake. (Jordan and Madsen.)
  Provo River, Provo, Utah. (Jordan and Madsen.)

Sacramento Basin:
  Sacramento River. (J. & G.)

Columbia Basin:
  Columbia River, Astoria, &c. (J. & G.)

Fraser's Basin:
  Fraser's River, New Westminster, B. C. (Gilbert.)

INDIANA UNIVERSITY, *January* 15, 1885.

IX.—REPORT UPON THE DEPARTMENT OF MOLLUSKS IN THE U. S. NATIONAL MUSEUM FOR 1885.

By WILLIAM H. DALL, *Honorary Curator.*

The *personnel* of the department at present is as follows:

William H. Dall, paleontologist to the U. S. Geological Survey, honorary curator.

Robert E. C. Stearns, U. S. Geological Survey, assistant curator.

Miss Agnes Nicholson, clerical assistant.

Mr. R. E. Call, temporary assistant.

At the beginning of the year the writer was still occupied by duties at the U. S. Coast and Geodetic Survey, which engaged him during the working hours of the day. In June the health of Mr. R. E. C. Stearns having improved he came on to Washington and accepted a post in the U. S. Geological Survey which incidentally included work on the Quaternary fossils and recent allies in the National collection. He was therefore assigned to duty as assistant curator of the Department of Conchology and at once entered upon the work. Owing to the decision of the Director, in accordance with the requirements of Congress in regard to the New Orleans Exposition, to exhibit a series of mollusks and shells from the Museum, Mr. Stearns was requested by me to take entire charge of the preparation and organization of the exhibit. He was very busily engaged until the middle of December in perfecting and packing the series which was finally dispatched to its destination. It comprised twenty large table cases exhibiting the economical mollusks of both coasts and of adjacent seas, the fresh-water mussels which form so remarkable a part of the fauna of the great Mississippi Basin, &c., a complete review of which will more appropriately come in, in the report of the year now opening, after the close of the exhibition.

To assist in this work Mr. R. Ellsworth Call, who has especial knowledge of the land and fresh-water mollusks of North America, was engaged for a period of six months.

In September the curator, desiring to devote his time more especially to biological investigation, resigned his position in the U. S. Coast Survey and accepted the post of paleontologist for the Quaternary invertebrates, offered by the Director of the U. S. Geological Survey.

The national collection of Quaternary shells and their recent allies being necessarily the source of identification of such fossils when newly collected and their ultimate repository, with the permission of the Director the curator retained his honorary connection with the Museum, which has lasted nearly twenty years. Work was immediately undertaken to put the general collection in such order that the geologist desiring to identify his fossils might do so with the least expenditure of time and labor.

In view of the arrears of work to be made up this was no small undertaking and the conclusion of it by no means near at hand.

As the most immediate needs of the paleontologist are at this time connected with the identification of the American land shells, that part of the collection was first attacked, with the co-operation of Messrs. Stearns and Call. It was placed in complete order, except so far as depositing in cases is concerned, and as soon as the latter, now constructing, are in readiness the collection will be arranged in them ready for examination and for use. The arrangement of the forms belonging on our southern and southeastern coast, so long neglected and so important in connection with the later fossiliferous beds of our Southern States, was undertaken by the curator himself, and a preliminary paper by him on some recently acquired material from that region appeared in the Proceedings of the Museum during the year. Incidentally it became necessary to determine some of the well-known group of Cones, and the entire collection belonging to that genus was carefully revised and is now in condition for satisfactory reference.

The intimate connection between our deep-sea fauna and that of the Tertiary beds of Southern Europe and the southern and western borders of the United States is well known to geologists and naturalists. A good deal of the leisure of the curator has been devoted to a study of the Gulf and Caribbean deep-sea forms obtained by Prof. Alexander Agassiz on the steamer Blake, a large number of which are already drawn for the engraver, and a considerable amount of text has accumulated. This fauna is intimately related to that of the formations of the isthmuses of Panama and Nicaragua, which separate the two oceans. Were it possible to obtain fuller series of the rocks and fossils from that region, a study of them would without doubt have an important bearing on the projects for piercing the rocky barrier which now stands in the way of commerce. The curator would recommend that, if it be possible, some steps be taken to obtain such a collection, which from the excavations now in progress at Panama would seem to be a work of no great difficulty if a collector were once placed on the spot.

It is with great satisfaction that the curator is able to report that heavy inroads have been made on the mass of material which has accumulated in the store-rooms of the Institution during the past ten years. Much still remains, but a great deal has been examined, catalogued, and assorted, partly for the reserve series and partly as duplicates for ultimate distribution to other museums or for exchange. Case room is the great need of the department at present, and it will continue for some time to be the most urgent want which presents itself.

Looking forward to the time when the collection shall be in working order and various suites now promised or in course of transmission shall have arrived, we may anticipate that in all that relates to North America and its adjacent seas the national collection as a whole will not be surpassed, or even equaled, in the world.

For the North Atlantic and British seas the collection of Dr. Gwyn Jeffreys is now in process of transmission.

For the northeastern coast of the United States the collections of the U. S. Fish Commission will eventually be deposited in the Museum. For the North Pacific, Bering and Arctic Seas the collections of Messrs. Dall, Turner, Fisher, Murdoch, the United States Revenue Marine, and others are already in the Museum and partly administered upon.

For the western coast of North America, from Puget Sound to Panama, the original Carpenter collection has long been a part of the Museum, and the Stearns collection has been recently acquired.

The preceding series are without doubt the finest and most valuable in existence relating to their respective regions, both in extent and scientific value.

For the Gulf coast, Antilles, and southeastern shores of the United States much material is on hand and more will doubtless be acquired very soon. It is the weakest section of our American collection at present, but may, with the assistance of the Fish Commission corps, not long remain so.

The land and fresh-water shells of the great interior region of the United States are well represented, though much more remains to be done before the collection in this regard can claim completeness. The series of types contributed by Mr. W. G. Binney, Dr. Isaac Lea, Henry Hemphill, and others, when administered upon and taken in connection with the Centennial collection arranged by Dr. James Lewis, will form a very satisfactory series, and the gaps which nevertheless exist may probably be filled by proper effort as the deficiencies become evident in arranging the material in hand.

In exotic material the collection consists chiefly of the contributions of the various United States exploring expeditions, Hon. Nicholas Pike and other friends of the Museum, and, while including many valuable types, bears no comparison in fullness and value to the strictly American sections, as, indeed, might naturally be expected.

A list of the chief accessions to the Department of Mollusks during the year is appended to this report. Though work of an administrative nature has occupied nearly all the time of the curator and his assistants, yet some contributions to original research have been made during the year. The most important of these are the determination of the systematic relations of *Turbinella pyrum* Linné, long a desideratum, and the investigation of *Chlamydoconcha*, a remarkable form of bivalve mollusk, with an internal shell, from California, which proves to be the type of a new family.

A list of the chief publications by the curator during 1884 is appended.

The number of entries made in the mollusk register during the past year is 5,231, but this is far from indicating the total number of accessions, the majority of which have been laid aside to be catalogued later, as occasion serves.

The total number of molluscan specimens in the possession of the Museum cannot be stated, as fully half of them are not catalogued; but it is safe to estimate them at not less than four hundred thousand, including duplicates and specimens in spirits. The number of species may approximate twenty thousand, but this is much more uncertain. Several years must elapse before a definite enumeration can be made. The number of entries in the mollusk register is about forty-one thousand, but this necessarily includes numerous duplications of the same species from different localities.

The following accessions have been made to the collection in this department during the year:

Adams, S. F., Lakeside, Beadle County, Dakota. Specimens of *Planorbis trivolvis*, from Dakota.

Baird, Prof. S. F., Secretary Smithsonian Institution and Director of the National Museum. Pearl from *Venus mercenaria* L., obtained at Wood's Holl, Mass., by T. S. Ellis. A remarkably large and fine example.

Beauchamp, Rev. W. M., Baldwinsville, N. Y. Shells of *Unio*, *Limnæa*, and *Bithinia*, from the State of New York.

Blochman, Lucien A., San Diego, Cal. Marine shells (*Litorina*, *Ostrea*, *Cerithidea*, &c.), from San Diego, Cal.

Call, R. Ellsworth, David City, Nebr. Land and fresh-water shells from Utah and Nevada, including types of new species, &c. A valuable series.

———. Specimens of *Unio Wardii* Lea, from Des Moines, Iowa.

———. Specimens of *Sphærium Jayanum* and *S. transversum*, from Des Moines.

———. Alcoholic specimens of *Limax maximus* L., from the District of Columbia.

———. Twelve species, 127 specimens *Unionidæ*, from Des Moines River, Iowa.

Coleman, W. W., 927 Ninth street, Washington, D. C. Specimen of *Loligo*, from Norfolk, Va.

Crawford, Dr. M. H., U. S. N., of U. S. S. Shenandoah, Lima, Peru. Specimens of mollusks and shells, dry and in alcohol, from latitude 52° 39′ south, and longitude 68° 34′ west, from the west coast of Tierra del Fuego, near the entrance of Magellan Strait.

Dale, Dr. F. C. (*See* Hungerford.)

Dall, *Rev. C. H. A., Calcutta, India.* One package marine shells from Madras, India.

Dore, *Harry E., Portland, Oreg.* Shells from Oregon, including the recently introduced European *Zonites cellarius* Mull.

Duges, *Prof. A., Guanajuato, Mex.* *Anodonta* and *Vermetus* from Mexico.

Edwards, *Vinal N., Wood's Holl, Mass.* *Lunatia heros* and *Mesodesma Jauresi*, in alcohol, from Wood's Holl, Mass.

Ellis, *T. S.* (*See* Baird, Prof. S. F.)

Grey, *J. W., Hartford, Conn., through Barnett Phillips, esq.* Specimens of *Cionella subcylindrica*, a small land snail, said to have fallen in a shower at Hartford, Conn., November 11, 1883.

Hayden, *T. Walton, Weston (Ont.), Canada.* Specimen of *Anodonta* from Hudson Bay Territory, in spirits.

Hemphill, *Henry, Oakland, Cal.* Three packages small mollusks and shells from Florida. These are among the most valuable contributions of the year, including chiefly small and rare species, some of which are new, and all valuable for their excellent condition, and accurate determination of habitat, locality, &c.

Hering *C. J., Paramaribo, Surinam.* Specimens of *Bulimus* and *Ampullaria* from Surinam.

Hungerford, *Dr. (through Dr. F. C. Dale, China).* Land, fresh-water, and marine shells from China and Philippine Islands.

Hydrographic Office, *U. S. Navy Department (through Commander J. R. Bartlett, hydrographer).* Nudibranchs, cephalopods, and other pelagic mollusks picked up at sea by Capt. J. R. Lyon of the bark Cashmere on a voyage from Liverpool to Calcutta and San Francisco.

India Museum, *Calcutta, by Prof. J. Wood Mason (through W. H. Dall).* *Turbinella pyrum* L., in alcohol. This shell, though extremely common in the Indian seas, has been hitherto unknown as to its soft parts. Its classification, hitherto doubtful, has been determined by means of the specimen above mentioned, obtained at the Andamans.

Jeffreys, *Dr. J. Gwyn, F. R. S., Kensington, England.* Two cases of gastropod mollusks, being an installment of the Jeffreys collection now being forwarded to the National Museum.

Jones, *Dr. William H., U. S. N., of the U. S. S. Wachusett, Callao, Peru.* A valuable collection of marine shells, dry and in alcohol, from the west coast of South America (chiefly Peru and Ecuador), and from the Galapagos (Chatham) Islands.

Kiefer, *George, Lima, Peru.* Shells, &c., in alcohol, from Peru.

Lehnert, *Rev. E., Washington, D. C. (through R. E. C. Stearns).* One hundred and thirty-three species and varieties of land and fresh-water shells from the District of Columbia, being a valuable contribution toward a local collection.

Mosely, *Prof. H. N., Oxford, England.* Microscopic slides, showing eyes of *Schizochiton incisus* and *Ornithochiton* sp.

Murdoch, *John.* (*See* Signal Office, U. S. A.)

Nichols, Lieut. Commander H. E., U. S. N. Ten species marine shells from British Columbia.

Orcutt, Charles R., San Diego, Cal. Specimens of mollusks, in alcohol, including the remarkable new type *Chlamydoconcha Orcutti* Dall, from San Diego, Cal.

Palmer, Dr. Edward. Specimens of *Pinna seminuda* and byssus, and *Strombus gigas* L., from Florida.

Phillips, Barnett, esq. (*See* Grey, J. W.)

Pilsbry, H. A., Davenport, Iowa. Specimen of the rare *Gundlachia meekiana* Stm., from Davenport, Iowa.

Shufeldt, Dr. R. W., U. S. A., Fort Wingate, N. Mex. Specimens of *Physa gyrina* Lea, from New Mexico, in spirits.

Signal Office, U. S. A. (*See also* Stejneger.) Specimens of shells from Point Barrow, Arctic Ocean, collected by Prof. John Murdoch and others of the Arctic meteorological station at Point Barrow, commanded by Lieut. P. H. Ray, U. S. A. A valuable collection from an almost inaccessible locality.

Stearns, R. E. C., Assistant Curator, U. S. National Museum. Specimens of shells from San Diego and Monterey, Cal.; also land and freshwater shells from Iowa and elsewhere, collected by R. E. Call.

Stejneger, Dr. Leonhard, Washington, D. C. Specimens of shells collected at the Commander Islands, Bering Sea, while acting as observer for the United States Signal Service. (This is a small but valuable collection and the only one known from the locality. It has been described in the Proceedings of the U. S. National Museum for 1884.)

Swan, J. G., Port Townsend, Wash. Specimens of large shellfish used for food, from Port Townsend and vicinity, for the economical series of food mollusks.

Townsend, Charles H., Baird, Shasta County, California. Shells from the Farallones Islands, off San Francisco, Cal.

Whiting, Frank H., Norfolk, Conn. Specimen of *Helix albolabris* Say, from Norfolk, Conn.

Wood-Mason, Prof. James. (*See* India Museum.)

Yarrow, Dr. H. C., U. S. A., Washington, D. C. *Anodonta* and *Physa*, from Utah.

Total for the year, about fifty lots, contributed by thirty-six persons.

There have been no publications based on the collections of the conchological department of the National Museum by parties unconnected with the Museum corps during the past year, though several investigations are in progress and will be announced later, especially by Messrs. Binney, Stearns, and Call.

X.—REPORT OF THE CURATOR OF THE DEPARTMENT OF INSECTS IN THE U. S. NATIONAL MUSEUM FOR 1884.

By C. V. RILEY, *Honorary Curator.*

The following list of accessions, arranged according to accession numbers, will indicate in a precise manner the character of the additions to the collection:

No. 13724. Large collection of insects of various orders collected in Labrador, sent by Mr. L. M. Turner, Washington, D. C.

No. 13846. Collection of various insects from Norfolk Island, sent by Mr. P. Herbert Metcalfe, Norfolk Island.

No. 13916. Various species of insects from Washington Territory, sent by Capt. Charles Bendire, Fort Klamath, Wash.

No. 13917. Various species from California, sent by Mr. Charles H. Townsend, Baird, Shasta County, California.

No. 13972. *Achorutes* sp. (Snow Podura) from New Jersey, sent by Mr. John J. Willis, Westfield, N. J.

No. 14004. White-grub fungus (*Cordyceps raveneli*) from Arkansas, sent by Mr. G. H. Horn, Liberty Springs, Van Buren County, Arkansas.

No. 14053. *Tarentula hentzii* and *Scolopendra heros* from Kansas, sent by the Army Medical Museum, Washington, D. C.

No. 14058. *Periplaneta americana* found on board of a whale ship, sent by Mr. Daniel Kelleher, New Bedford, Mass.

No. 14065. Ephemerid larva from Texas, sent by Mr. C. C. Bearden, Bedford, Tex.

No. 14150. Various insects and insect larvæ from Paramaribo, Surinam, sent by Mr. C. J. Hering, Paramaribo, Surinam.

No. 14166. Clover-hay Worm (*Asopia costalis*) from Virginia, sent by Mr. R. H. Downman, Warrenton, Va.

No. 14204. Bag-worm (*Thyridopteryx* sp.) from Arkansas, sent by Mr. Michael T. Omally, Hot Springs, Ark.

No. 14269. *Periplaneta americana* from Saint Mary's River, Florida, sent by U. S. Fish Commission steamer Fish Hawk.

No. 14298. *Achorutes* sp. (Snow Podura) from Colorado, sent by Mr. H. C. Lay, jr., Telluride, Colo.

No. 14325. Box of Coleoptera for determination, sent by Mr. E. Wilkinson, jr., Mansfield, Ohio. (Returned to sender at his request).

No. 14333. *Belostoma americanum* from New York, sent by Mr. J. P. Wood, Auburn, Cayuga County, New York.

No. 14059. *Rhynchophorus cruentatus* (imago) from Florida, sent by Mr. W. J. de Poincy, Manatee, Fla.

No. 14518. *Corydalus cornutus* from North Carolina, sent by Mr. E. O. Tate, Warm Springs, N. C.

No. 14530. Small collection of various insects from San Diego, Cal., sent by Mr. Charles R. Orcutt, San Diego, Cal.

No. 14557. *Attacus cecropia* from Missouri, sent by Capt. A. E. Miltimore, U. S. A., Jefferson Barracks, Mo.

No. 14565. *Anthrenus scrophulariæ* (larvæ) from Connecticut, sent by Mr. J. N. Bishop, Plainville, Conn.

No. 14574. *Coptocycla clavata?* (pupa) from Delaware, sent by Mr. Frank Stayton, Greenwood, Del.

No. 14584. *Buthus* sp. from California, sent by Mr. H. W. Turner, U. S. Geological Survey, San Francisco, Cal.

No. 14585. *Rhynchophorus cruentatus* (cocoon) from Florida, sent by Mr. W. J. de Poincy, Manatee, Fla.

No. 14588. Various insects from New Idria, Cal., sent by Mr. H. W. Turner, U. S. Geological Survey, San Francisco, Cal.

No. 14600. Hemerobiid larva from Florida, sent by Dr. A. B. Brookins, Bartow, Fla.

No. 14620. Larva of *Eristalis* from Pennsylvania, sent by Mr. B. W. Stennett, Corry, Erie County, Pennsylvania.

No. 14625. Cordyceps on Lucanid larva, sent by Messrs. R. T. Baily and W. J. Etzel, Union, S. C.

No. 14630. *Ascalaphus hyalinus* from Long Island, N. Y., sent by Dr. Walter Mendelson, Southampton, Long Island.

No. 14667. Various insects from California, sent by Mr. R. E. C. Stearns, U. S. National Museum.

No. 14671. *Rhyssa lunator* from Massachusetts, sent by Mr. C. E. Abbe, Sara Sota, Fla.

No. 14693. *Photinus ardens* from Maine, sent by Mr. Amos Wilder, Augusta, Me.

No. 14695. *Stenopoda cinerea* from Florida, sent by Mr. J. Edwards Allen, Orlando, Fla.

No. 14724. *Otiorhynchus ligneus* from Massachusetts, sent by Miss L. Ferry, East Hampton, Mass.

No. 14748. *Madognatha* (*Theraphosoidae*) sp. from New Mexico, sent by Mr. Theodore W. Taylor, Lake Valley, N. Mex.

No. 14753. *Mygale* sp. from Arizona, sent by Mr. E. W. Nelson, Huachuca, Cochise County, Arizona.

No. 14779. *Deilephila lineata* from Nevada, sent by Mr. Charles Keenan, hospital steward, U. S. A., Fort Halleck, Nev.

No. 14780. Four species of insects from Colorado, sent by Mr. M. E. Cromley, Dolores, La Plata County, Colorado.

No. 14794. Bulb of Erigenia (not entomological) from Texas, sent by Dr. G. P. Hackenberg, Austin, Tex.

No. 14820. *Diapheromera femorata* from Massachusetts, sent by Mr. E. P. Upham, Smithsonian Institution.

No. 14821. *Acanthocinus spectabilis* from California, sent by Mr. John J. Snyder, Murphy's, Calaveras County, California.

No. 14913. *Lagoa operculata* (larva) from North Carolina, sent by Mr. N. A. Ramsey, Durham, N. C.

No. 14952. *Lygæus fasciatus* from Illinois, sent by Mr. Ely C. Fisk, Havana, Mason County, Illinois.

No. 15012. *Plectrodera scalator* from Illinois, sent by Mr. Ely C. Fisk, Havana, Mason County, Illinois.

No. 15027. *Epeira insularis* from Illinois, sent by Mrs. R. E. Call, Willersburg, Ill.

No. 15034. Three species of insects from Iowa, sent by Dr. J. M. Shaffer, Keokuk, Iowa.

No. 15043. *Mygale* sp. from Mount Diablo, Cal., sent by Mr. H. W. Turner, San Francisco, Cal.

No. 15062. *Epeira insularis* from Illinois, sent by Mr. Charles M. Sturges, Chicago, Ill.

No. 15069. *Rhyssa lunator* from South Carolina, sent by Mr. George T. Brown, Belton, S. C.

No. 15142. Various insects, mostly aquatic larvæ, from Utah, sent by Dr. H. C. Yarrow, Army Medical Museum, Washington, D. C.

No. 15251. *Blatta orientalis ?* (larva) from California, sent by Mr. T. S. Price, Borden, Cal.

No. 15458. Egg-mass of *Clisiocampa* sp. from Utah, sent by Mr. J. B. Rosborough, Salt Lake City, Utah.

No. 15523. *Achorutes* sp. (Snow Podura) from Maine, sent by Mr. Amos Wilder, Augusta, Me.

Altogether the most valuable collection received during the year is that made by Mr. Turner in Labrador. The material is quite extensive, especially in individuals, and has been collected and preserved with great care and judgment. I have, therefore, taken great pains to mount such of the alcoholic material and such of the dry material as would most quickly deteriorate if left as collected, in order that it may be permanently preserved for future study, and I have been particular to attach to every specimen, not only the accession number, but the number used by the collector, so as to facilitate his own work upon the collection.

The work of the department has consisted, in addition to the ordinary correspondence and determination of material, in the proper care, so far as time would permit, of the material received. But taking advantage of the Government's participation in the New Orleans Exposition, I have prepared, as a part of the exhibit from the Department of Agriculture, a collection illustrative of economic entomology, employ-ing therefor drawers and cases made after the unit plan of the Museum. Many of the specimens for this exhibit were furnished from my private collection, and it has been prepared upon the understanding with the proper authorities that it is, when returned to Washington, to form part of the Museum collection.

In closing this brief report I cannot refrain from repeating the recommendations of previous years both as to the utilization of the plates purchased of the late Prof. Townend Glover and as to the necessity of placing the department upon a secure financial basis.

Mr. Glover's plates and notes on the Diptera, Orthoptera, Hemiptera, and cotton insects have already been published, in very limited edition, as "Manuscript Notes from my Journal." Those of the remaining orders comprise about 200 plates, which can be printed from by Mr. A. G. Gedney, of this city (who formerly printed for Glover and has made me his estimates), for $13.50 per 1,000 copies, quarto impressions. The printing of an edition of 1,000 would, therefore, cost about $270, while the printing of such text as would be necessary could probably be done for about $500 additional.

Several valuable collections have, as during previous years, been offered for sale at remarkably low rates, some of which I have purchased individually and deposited with the rest of my collections. The need of a salaried assistant is each year more obvious, not only for the reasons stated in previous reports, but as a guarantee of the proper future care, in case of my death or removal from the city, of the entomological material already in the Museum, and as a further guarantee to specialists that type collections, if donated, will have proper appreciation and preservation.

XI.—REPORT OF THE DEPARTMENT OF MARINE INVERTEBRATES* IN THE U. S. NATIONAL MUSEUM FOR 1884.

By RICHARD RATHBUN, *Curator.*

ACCESSIONS.

The record of accessions to this department of the Museum during the year just passed is unusually satisfactory. Several identified collections of great value have been obtained from well-known European and American authorities, and a large amount of material for future elaboration has been received. The most important additions were made, as usual, by the U. S. Fish Commission, and represent the recent deep-sea explorations of the steamer Albatross over a wide area. Large collections were likewise obtained from other sources. The total number of accessions was 72, and the number of shipping packages of all sizes received, 240. This enumeration does not, however, convey an adequate conception of the extent of the additions to the department, as several of the accessions amounted to more than 1,200 packages each, if all the jars, bottles, vials, and small boxes are counted. The principal additions were as follows:

The U. S. Fish Commission: Very large and valuable collections were transferred to this department by the Fish Commission in 1884. Certain portions of these collections having been worked up, and reports upon them presented to the Commissioner, they now come into the permanent possession of the Museum, but other portions are to be regarded as simply in its custody for safe-keeping.

Over 1,200 packages were received from the cruise of the steamer Albatross in the Caribbean Sea and Gulf of Mexico and among the West Indian Islands, from January to May, 1884; but this number does not include many samples of bottom materials obtained at the sounding stations in connection with the work of the Hydrographic Bureau, and elsewhere credited to the Navy Department. This collection will largely supplement the very valuable results recently obtained by the Coast Survey steamer Blake in the same region. It contains many representatives of all the principal groups of marine invertebrates common to that area, from the littoral zone to a depth of 1,700 fathoms, an especial feature being a large and fine series of Crinoids (*Pentacrinus*) from off Havana and elsewhere. Considering that during this cruise the Albatross was mainly occupied with hydrographic work, the collection does much credit to the energy and zeal of the officers and naturalists attached to the vessel. The Crustacea have been sent to Prof. S. I. Smith, at New Haven, Connnecticut, for study; the Anthozoa are to be examined by Prof. A. E. Verrill; and the Echini have already been worked up by the curator of the department. The Annelids, which are not included in the above enumeration, were retained on board the steamer, where they are being studied by Mr. James E. Benedict.

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* Exclusive of the Mollusca.

Fifty-six cases, including 1,400 packages, of specimens resulting from the explorations of the steamers Albatross and Fish Hawk, during last summer, off the eastern coast of the United States, between George's Bank and the latitude of Cape Hatteras, were sent direct from the Wood's Holl station to the Museum. The greater part of this material had been examined and identified by the naturalists at Wood's Holl, but much of it is still undetermined. An additional collection made by the steamer Albatross on her return trip from Wood's Holl to Washington was received in November.

Eleven cases, containing nearly 800 packages, of alcoholic specimens, and 171 species, have been received from Prof. A. E. Verrill. These represent a portion of the results of Professor Verrill's studies on the Echinoderms and Anthozoa, and of those of Prof. S. I. Smith on the Crustacea, made at New Haven during the year. The collection of deep-sea barnacles stored at New Haven has also been turned over to the Museum by Professor Smith, for transmission to Dr. P. P. C. Hoek, of Leyden, a competent authority, who has offered to examine and report upon this group.

Several smaller collections were sent in by or through the Fish Commission, as follows: Specimens of various kinds obtained at the mouth of Saint Mary's River, Florida, in March, by the steamer Fish Hawk; Crustaceans and Radiates collected by Dr. T. H. Bean at Fire Island Beach and Patchogue, Long Island, during the summer; numerous Crustaceans from Mr. E. G. Blackford, of New York; specimen of Crustacean fish parasites from Vineyard Sound, Massachusetts, and of rare Crustaceans obtained by the steam-dredger working about the new pier of the Fish Commission at Wood's Holl, from Mr. Vinal N. Edwards.

The following donations from Gloucester fishermen were also received through the Fish Commission: Specimens of sponges and corals from the fishing grounds off the provincial coast; specimen of cup sponge and several Bryozoan corals from the fishing grounds north of Iceland, collected and donated by Capt. J. A. Dago, of the schooner Concord; a lobster from near Gloucester, Mass., of which one side is of the normal color and the other red, or similar to the color produced by boiling. On this interesting specimen the two colors are equally distributed and meet along the median line of both the dorsal and ventral surfaces. In no place does either color encroach upon the other, but their line of demarkation is as distinctly marked as though the specimen had been colored by hand, although it is undoubtedly a genuine freak of nature.

Dr. Edward Palmer: Sixty-five cases of Corals, Sponges, Crustaceans, and Echinoderms from Southern Florida and the Dry Tortugas. This is the largest collection, next to that of the Fish Commission, received by this department during the year, and was made in the interest of the New Orleans International Exposition, through the funds appropriated for that purpose by Congress. In detailing Dr. Palmer for this undertaking, it was with the intention of bringing together as exhaustive a collection as possible of the more important and conspicuous animal products of the coral-reef region of Southern Florida, which, considering its many interesting economic and biological features, has never been properly represented hitherto, either in the National Museum collections or in connection with any of our great expositions. The results obtained by Dr. Palmer were eminently satisfactory, although it is impossible at so early a date to make anything like a complete report upon his collection. Its value is greatly enhanced by the very full notes which accompany it. It has been entirely unpacked, and all of the specimens have been separately labeled, to insure their future identity beyond a possibility of error or confusion. The dried specimens of small to medium size have been stored in unit trays (of which they fill about 100), temporarily arranged in the west hall of the Smithsonian Institution. The larger corals have been retained in their original cases, from which the packing materials have been removed. The Actinian or stony corals comprise the bulk of the collection, although there is a large representation of Gorgonian corals, and the number of finely prepared sponges is very great. The Crustaceans and Echinoderms, of which there are many specimens and species, are mainly preserved in alcohol.

Henry Hemphill: A very extensive collection of alcoholic and dried specimens of marine invertebrates from the west coast of Florida, between Cedar Keys and Charlotte Harbor, obtained from the shore and from shallow water by dredging. This collection was made with great care during the winter and early spring, and consists largely of the smaller forms of animal life, such as collectors seldom look for. The groups mainly represented are the Crustaceans, Annelids, Echinoderms, Alcyonian and Actinian corals, and sponges. Although coming from a region closely bordering that visited by Dr. Palmer, this collection does not in any way duplicate his, being of an entirely different character.

The additions made to the Museum collections from the Antillean region during 1884, by the steamer Albatross, Dr. Palmer, and Mr. Hemphill, form together the most complete and important contribution which this department has lately received from any one faunal area.

Navy Department and naval officers: From the Bureau of Navigation, 168 bottom samples from the sounding stations of the steamer Albatross, Lieut. Commander Z. L. Tanner, U. S. N., commanding, in the Caribbean Sea and Gulf of Mexico, from January to May, 1884. During this period the Fish Commission steamer Albatross was temporarily in the service of the Navy Department for surveying purposes, and the specimen results obtained in soundings were afterwards transferred to the Museum. From the same Bureau, many samples of ocean bottom obtained by the U. S. S. Enterprise during a cruise from the United States to the Asiatic station *via* the Cape of Good Hope.

From the Hydrographic Bureau, two jars of surface specimens collected by the British bark Cashmere, during a voyage from Liverpool to Calcutta and from Calcutta to San Francisco.

From Dr. W. H. Jones, U. S. N., U. S. S. Wachusett, three valuable collections of Echinoderms and Crustaceans from various parts of the Pacific Ocean, principally the Sandwich, Samoan, Society, Marquesas, and Galapagos Islands, and the coasts of Chili, Peru, and Ecuador. These contributions from Dr. Jones have been among the most interesting received by this department during the past year. They contain an exceedingly large number of specimens and species, carefully preserved and labeled, and will supply many deficiencies in the collection, as well as replace numerous old and damaged specimens brought in by the earlier expeditions to the same region.

From the Greely relief party, Commander W. S. Schley, U. S. N., commanding, and Ensign C. S. McClain, U. S. N., naturalist of the Alert: A collection of Crustaceans and other marine invertebrates from the west coast of Greenland.

From Lieut. H. H. Barroll, U. S. N., a finely preserved specimen of *Ranina*, from Lamock Island, China.

From Dr. M. H. Crawford, U. S. N., specimens of sea-urchins and Hydroids from the west coast of Terra del Fuego.

Capt. M. A. Healy, U. S. R. M., commanding the revenue cutter Corwin, on the Pacific coast: An interesting collection of marine invertebrates from the northwestern coast of Alaska, preserved in alcohol. The majority of the specimens were obtained by dredging in depths of 16 to 32 fathoms, between 65° 49′ 15″ and 71° 02′ north latitude, and 157° 46′ and 169° 04′ 30″ west longiude. A few also were from the shore.

President D. S. Jordan, of Indiana University: Collection of Crustaceans and Echinoderms from Key West, Florida.

McKesson & Robbins, New York: A collection of sponges, including all the Mediterranean commercial varieties and many from Florida. This collection contains several interesting specimens illustrating the mode of growth and attachment of sponges, and, together with the series already furnished by the same dealers and others, furnishes the

Museum with a most complete representation of all the known commercial sponges of the world.

Collections received in exchange: From the Rev. A. M. Norman, of England, 229 species of marine invertebrates from the British Islands and Norway, distributed among the different groups as follows: Crustacea, 119 species; Mollusca, 57 species; Tunicata, 14 species; Echinodermata, 32 species; Actinozoa, 2 species; Sponges, 5 species. As regards the British Decapod Crustaceans, this collection is said to be one of the finest ever sent out from England. Most of the specimens are preserved in alcohol, but some of the larger ones are dried and in suitable condition for the exhibition series. Further exchanges with Mr. Norman are now in progress.

From Prof. G. Stewardson Brady, of England, 88 species of Copepod Crustaceans, of which four species are true parasites, and the remainder free-swimming or semi-parasitic forms, from Great Britain and from the Challenger collections made in different parts of the world.

From Mr. Edward Lovett, of England, carefully made alcoholic preparations of 53 species of stalk-eyed Crustaceans from the British Channel. This is an exceedingly instructive collection, and is accompanied by notes giving the range and abundance of each species, and indicating those that are used as food.

From Prof. H. N. Moseley, of Oxford University, England, finely prepared specimens of the liver-fluke, *Fasciola hepatica*, some preserved in glycerine and others mounted in Canada balsam, with dried specimens of *Limnæus truncatulus*, the host of its Cercaria stage; also alcoholic preparations of the fresh-water Polyzoan, *Cristatella repens*, and the fresh-water Hydro-Medusa, *Lymnocodium Sowerbii*, from the Victoria Gardens, Regent's Park, London.

From Bergen's Museum, Bergen, Norway, 55 species of Echinoderms from the coast of Norway and from the explorations of the Norske Nordhavs expedition (Norwegian North Atlantic expedition). The several groups are represented as follows: Holothurians, 16 species; Sea-urchins, 9 species; Star-fishes, 17 species; Ophiurans, 12 species; Comatula, 1 species. This is a valuable collection for comparison with North American forms.

ROUTINE WORK.

The care and preservation of the numerous large collections received by this department during the past year have demanded the almost constant attention of the curator and his assistants, and but little time has been available for original researches and the preparation of specimens for exhibition. Every case of specimens turned over to the department has been at once unpacked and its contents assorted, classified and catalogued; but the lack of ample storage space has prevented the systematic arrangement of these materials, and has greatly interfered with the progress of all work upon the collections. The work of administering upon the marine invertebrates obtained by the Fish Commission has also fallen to this department and has occupied much time. Portions of the general collection have been overhauled from time to time for the purpose of placing specimens in better condition for study and reference, and in June the entire series of alcoholics was examined and the alcohol renewed where necessary. The collection of Echini has received most attention from the curator, as elsewhere noted, and at the time of writing is in better condition than any other collection of the department.

The exhibition series of specimens has been entirely rearranged so as to present a more systematic sequence, and it now fills all of the wall cases which nearly surround the west hall of the Smithsonian Institution. The large amount of material stored in the hall, however, prevents its being opened to the public. A few large specimens of Crustacea and corals have been mounted during the year and added to this series.

The preparation of the fourth series of duplicates, comprising 200 sets, each containing 108 species, selected from the collections turned in by the Fish Commission, was completed in the spring, and many of the sets have already been sent out.

The cataloguing of specimens has kept pace with the work upon collections, and 5,667 entries have been made in the record books during the year. This number includes the entries of specimens of marine invertebrates collected by the Fish Commission, all of which are entered in the catalogue books of the department as the most convenient method of recording them.

Three collecting outfits were supplied during the year, as follows: To Ensign C. S. McClain, U. S. N., who acted as naturalist on the steamer Alert of the Greely relief party to Lady Franklin Bay; to Lieut. George M. Stoney, U. S. N., who has been engaged in explorations in Alaska; and to Dr. Edward Palmer, whose large collection from the Florida reefs has already been described.

From the middle of July to the middle of October the curator and Mr. Baldwin took part in the summer explorations of the Fish Commission at Wood's Holl, Mass. The character of the work accomplished in this connection, so far as it relates to this department of the Museum, is described further on.

Mr. A. H. Baldwin has been employed as general assistant since April 10. Ensign C. S. McClain, U. S. N., assigned to duty at the Smithsonian Institution in 1883 by the Secretary of the Navy, rendered efficient services upon the collections during the first half of the year, or until he joined the Greely relief party in June. Mr. Thomas Lee, of Boston, acted as a volunteer assistant during November and December, and Miss M. J. Rathbun was assigned to this department on the 1st of December.

Cataloguing.—The total number of entries of specimens made in the record books for 1884 was 5,667, distributed among the several groups as indicated in the table given below. Each entry indicates a separate package (jar, bottle, homeopathic vial, box, or tank), containing a single species, although the same species may be duplicated several times by being represented by specimens from different localities. The entries are not limited to identified specimens, but all collections are catalogued as soon as sorted, in order that an accurate account may be kept of the vast accumulation of materials which now more than fill the storage space allotted to them. A card catalogue is also kept, and is intended to cover all the entries in the record books. In so far as they refer to identified materials, the cards are arranged in systematic order, permitting of easy reference to the species, while the remainder are arranged serially as to the catalogue numbers, and constitute the working catalogue, being more convenient for handling than the large record books.

Table showing entries in record books for 1884.

Groups.	Entries to Jan. 1, 1884.	Entries to Jan. 1, 1885.	Entries made during 1884.
Crustacea	5, 719 7, 500	7, 230 8, 913	1, 511 1, 413
Worms	729	880	151
Tunicates and Bryozoa	209	298	89
Radiates	6, 840	8, 698	1, 858
Protozoa and sponges	1, 115	1, 760	645
Total	14, 612	20, 279	5, 667

DISTRIBUTION OF DUPLICATES AND EXCHANGES.

A large number of duplicate specimens have been distributed during the year, mainly to institutions in the United States. In this manner the Museum has been relieved of the care of much material of no further use to its workers, and students elsewhere have been given the benefit of its resources. Nearly all the collections sent out belonged to the regular series of duplicates described in former reports and referred to elsewhere in this report. These have been made up from duplicates resulting from the explorations of the U. S. Fish Commission, and are collections of great value, a large share of the species they contain being recent additions to science from deep water. As has been the custom hitherto, no returns have been demanded from American institutions supplied with these sets, but collections have been sent to foreign countries only in exchange. Forty-eight sets belonging to the regular series were sent out in 1884 to the following institutions:

London series, containing 225 species (sent in exchange): University of Edinburgh, Edinburgh, Scotland.

Series II, containing about 190 species each: State University, Bloomington, Ind.; Rochester University, Rochester, N. Y.; Johns Hopkins

University, Baltimore, Md.; Brown University, Providence, R. I.; Cincinnati University, Cincinnati, Ohio; University of Wisconsin, Madison, Wis.; University of Pennsylvania, Philadelphia, Pa.; Albion College, Albion, Mich.; Skaneateles Library Association, Skaneateles, N. Y.; Syracuse University, Syracuse, N. Y.; Trinity College, Hartford, Conn.; Swarthmore College, Swarthmore, Pa.

Series IV, containing 108 species each: Foster School, Clifton Springs, N. Y.; Penn College, Oskaloosa, Iowa; Jacksonville Female Academy, Jacksonville, Ill.; High School, Piqua, Ohio; West Virginia University, Morgantown, W. Va.; Northwestern Ohio Normal School, Ada, Ohio; Leicester Academy, Leicester, Mass.; Drury College, Springfield, Mo.; Miller Manual Labor School, Crozet, Va.; Perkins Institute and Massachusetts School for the Blind, South Boston, Mass.; Agassiz Association, chapter 387, Baltimore, Md.; Lasell Seminary, Auburndale, Mass.; Williams School, Auburndale, Mass.; Saint Lawrence University, Canton, N. Y.; Normal School, Potsdam, N. Y.; Saint Mary's Institute, Dayton, Ohio; State Normal School, Providence, R. I.; Central University, Richmond, Va.; Parsons College, Fairfield, Iowa; Brethren's Normal College, Huntingdon, Pa.; Saint Joseph's Commercial College, Saint Joseph, Mo.; Park College, Parkville, Mo.; Female Orphan School, Camden Point, Mo.; State Insane Asylum, Saint Joseph, Mo.; Southwestern Presbyterian University, Clarksville, Tenn.; Chaddock College, Quincy, Ill.; Denison University, Granville, Ohio; Otterbein University, Westerville, Ohio; F. G. Galbraith, Bainbridge, Pa.; the University, Lewisburg, Pa.; Wagner Free Institute of Science, Philadelphia, Pa.; Westtown Boarding School, Westtown, Pa.; State Normal School, West Chester, Pa.; Beechcroft School, Spring Hill, Tenn.; Goddard Seminary, Barre, Vt.

A collection of 34 species of Crustacea, from the recent deep-sea dredgings of the Fish Commission steamers Fisk Hawk and Albatross, were sent in June to the Rev. A. M. Norman, of England, who is now preparing a series of British species in return. Several other small collections of only one or a few species each, have been supplied, by request, to American students, to be used in special investigations.

In the annual report for 1883 reference was made to five sets of duplicates sent to Europe under the system of exchanges mentioned above. Returns have been received for three of these sets, as follows: From the Rev. A. M. Norman, from Prof. G. Stewardson Brady, and from Prof. H. N. Moseley, of Oxford University, the acknowledgments for which have already been made under the accessions. For the collection of Echinoderms received from Bergen's Museum this Museum is still indebted, and a suitable return will soon be made. From the Royal Academy of Stockholm, Sweden, a suite of specimens from the collection of the Vega Arctic expedition is promised, and from the University of Edinburgh, Scotland, a collection of British species.

THE U. S. FISH COMMISSION.

A brief account of those explorations of the Fish Commission for 1884 which have been productive of valuable zoological results, now or soon to be shared in by the National Museum, will not be out of place in this connection, although reference has already been made to them under the accessions.

The steamer Albatross, under command of Lieut. Commander Z. L. Tanner, U. S. N., continued in active service during nearly the entire year. From January to May she was detailed for sounding operations in the Gulf of Mexico and Caribbean Sea, under the direction of the Hydrographic Bureau of the Navy Department, but was also able to make many dredgings, and visited several interesting ports, where the naturalists occupied their time to good advantage. Mr. James E. Benedict was the naturalist in charge, and was assisted by Mr. Willard Nye, jr., of New Bedford, Mass., who volunteered his services. Several of the officers also did effective work in the collecting of specimens. One of the most interesting localities visited was that directly off Havana, on the north side of Cuba, where *Pentacrinus* is known to occur abundantly, and where numerous specimens of that curious animal were obtained by means of the tangles, the bottom being too rough to permit of the use of any other appliance. Nearly all the other dredgings were made in the Caribbean Sea, and were distributed over many parts of that important zoological region. Fifty-three dredgings were made, in depths of 5 to 1,701 fathoms, 26 being in depths greater than 200 fathoms. The ports and islands visited, at which shore-collections and shallow-water dredgings from a small boat were made, are as follows: Key West, Fla.; the island of St. Thomas; Jamaica; the island of Old Providence, off the coast of Nicaragua; the island of Curaçao, off the coast of Venezuela; the town of Sabanilla, United States of Colombia, and San Antonio, Cuba.

The zoological specimens obtained during this cruise were brought directly to the National Museum, where they were sorted and catalogued. The Crustacea have been sent to Prof. S. I. Smith, of New Haven, Conn., who writes that they include many exceedingly interesting forms. The Echini have been worked up by the curator, who will soon report upon them in the Proceedings of the Museum. Of this group 25 species were obtained, 9 being littoral forms and 16 from depths of 25 to 1,639 fathoms. Mr. Benedict is studying the Annelids, but the other portions of the collection have not yet been referred for examination, although Professor Verrill offers to report upon the Anthozoa, and Prof. L. A. Lee upon the Foraminifera.

In July the Albatross resumed her explorations of the eastern coast, which were continued until the latter part of October. During this time the headquarters of the Fish Commission were at Wood's Holl, Mass., where a permanent summer station has been established. Suitable wharves and buildings to accommodate the investigating work of the Commission, have been in course of preparation at this point for some time, and the more important ones are now nearly completed; but during last summer it was still necessary to make use of the small frame laboratory building put up some years ago, and which, though amply commodious for the small party then in the field, does not afford sufficient facilities for the work as it is now carried on. The new improvements comprehend a large, square stone pier and wharves for the use of steamers, and inclosing several basins for fish culture, and a laboratory building three stories in height. The lower story of the laboratory will be devoted to fish culture, to the larger experimental aquaria, and to the coarser kinds of work; the second and third stories, to the laboratory work-rooms proper, which will be fully equipped for all the investigations to be carried on in connection with the study of the ocean fisheries. It is also intended to reserve sufficient space for the use of special workers in biology who may desire to study any of the materials brought in by the steamers of the Commission, and which it would be difficult for them to obtain by other means.

Many of those who have participated in the summer explorations of the Commission have given their services gratuitously, and it has, therefore, been possible to organize a much larger corps of assistants during that season than the funds of the Commission would otherwise have permitted. The zoological investigations this year were carried on under the immediate supervision of Prof. A. E. Verrill, who has been connected with the Commission since the first year of its establishment. His associates and assistants in the laboratory work, in addition to the curator, Mr. Peter Parker, jr., and Mr. A. H. Baldwin, who belong to the permanent staff of the Commission, were Prof. S. I. Smith, of Yale College; Mr. Sanderson Smith, of New York; Prof. L. A. Lee, of Bowdoin College; Prof. Edwin Linton, of Washington and Jefferson College; Mr. H. L. Bruner, of Illinois; Mr. B. F. Koons, of the Storrs Agricultural School, Connecticut; Mr. J. H. Blake, of Cambridge, Mass. (as artist); Ensign W. E. Safford, U. S. N.; and Mr. Willard Nye, jr., of New Bedford, Mass. Mr. James E. Benedict continued in charge of the natural history work on the steamer Albatross, and during the several trips made from Wood's Holl was assisted by two or more of the persons mentioned above, Mr. Sanderson Smith and Mr. Peter Parker being constant members of the steamer party. Ensign R. H. Miner, U. S. N., of the Albatross, was associated with Mr. Parker in the care of the fishes.

The active work of exploration was begun by the Albatross immediately after leaving Washington, and many important results were obtained before she reached Wood's Holl, in the latter part of July. Scarcely any time was lost during the entire summer from unfavorable weather or other causes, and her cruising continued until the very last of October, thus covering a continuous period of fully three months. The area explored extended from the southern edge of George's Bank to the latitude of Cape Hatteras, North Carolina, and into a depth of water of 2,574 fathoms, at a point more than half way between our coast and the island of Bermuda. A large number of temperature and other physical observations, bearing upon the migrations of mackerel and menhaden, were made, and large quantities of the small surface organisms on which those fish feed, were carefully collected. The abruptly sloping bottom at the inner edge of the Gulf Stream was thoroughly investigated at numerous places, and large collections of marine life obtained, but no traces were found of the once abundant tile-fish (*Lopholatilus chamæleonticeps*), which first attracted the attention of the Commission to this exceedingly rich region. Several lines of dredgings and of bottom and serial temperature' were carried outward from the inner edge of this slope into depths of 1,000 to 2,500 fathoms, and other similar lines were made to connect it with the shore soundings. The data thus far obtained regarding this region are in many ways very complete, and when properly worked up will have an important bearing upon several interesting fishery problems.

Very important discoveries from a geological point of view were made in regard to the nature of the materials composing the sea bottom at great depths under the Gulf Stream, and a brief report upon this subject has already been published by Professor Verrill. In depths of 500 to 1,200 fathoms the bottom was often "found to consist of tough and compact clay so thoroughly hardened that many large and angular fragments, sometimes weighing more than fifty pounds, have been brought up in the trawl. * * * This material is genuine clay, mixed with more or less sand" and with a small percentage of the shells of Globigerina and other Foraminifera."

The amount of zoological material obtained was very great, and some of it was of much interest. Even from the deeper hauls a great variety of life was obtained, and many very large and showy species, including a number of new forms. A large part of this material has already been turned over to the Museum, and the entire results will soon be represented in our collection.

The number of dredgings made by the Albatross, in the summer of 1884, was 141, of which 49 were in depths between 100 and 1,000 fathoms, 20 between 1,000 and 2,000 fathoms, and 5 above 2,000 fathoms. The last cruise was mainly devoted to the region lying off Cape Hatteras, and 45 dredgings were there made, in depths of 7 to 671 fathoms, with good results. The specimens collected on this trip were brought directly to Washington and sorted and catalogued in the Museum.

At the close of 1884 the Albatross is making preparations for another cruise to the Gulf of Mexico to investigate the important fishing grounds bordering the coasts of the Southern States. It is expected that she will also make valuable additions to her collections of the previous winter.

RESEARCHES.

This department has been greatly benefited during the year past by the researches of Prof. A. E. Verrill and Prof. S. I. Smith, of New Haven, Conn., on the deep-sea invertebrates obtained by the Fish Commission in its recent explorations. An account of the materials identified by them and received from New Haven and from the Wood's Holl station, has been given above. Professor Verrill has devoted most attention during the year to the Mollusca, but he has also studied large numbers of Echinoderms and Anthozoa, and several new species in those groups have been described by him in the reports cited under his name in the bibliography. The Museum collection now contains nearly all the species of Echinoderms and Anthozoa discovered in the deep water off the eastern coast, so far as they have been worked up. The studies of Professor Smith have been mainly upon the higher Crustacea, of which he has turned over to the Museum a large number of species.

Mr. Sanderson Smith, of New York, a member of the Fish Commission party during each summer, spent about two months at the Museum after the close of last season's explorations, sorting and identifying the Mollusca collected on the last cruise of the Albatross. The Hon. Theodore Lyman has also, in the leisure time at his disposal, continued his studies of the Ophiurans obtained by the Albatross in the Gulf of Mexico and Caribbean Sea from January to May, 1884.

Mr. James E. Benedict, the naturalist of the Albatross, has carried on his investigations of the Annelids on board that steamer or at his house, and will soon have material ready for transfer to the Museum. Mention may here be made of the fact that the Foraminifera of the Fish Commission collection are in the hands of Prof. L. A. Lee, of Bowdoin College, for study, and that the Entozoan parasites of fishes have been referred to Prof. Edwin Linton, of Washington and Jefferson College; but it is yet too early to expect reports from these gentlemen.

The curator, while at Wood's Holl during the summer, identified the described species of parasitic Copepods contained in the Museum collection, and which were mainly obtained by the Fish Commission. An annotated list of the same has been published in the Proceedings of the Museum for 1884. Drawings and preparations of several new species not yet published were also made. He has also worked up the species of Echini belonging to the collection made by the Fish Commission steamer Albatross from January to May, 1884, in the Gulf of Mexico and Caribbean Sea. Although no new species were discovered, the collection is a valuable addition to this department. The work of identifying and revising the Museum collection of Echini, one of the largest and most important of its kind in the world, has been continued through the year, and it will probably be possible during 1885 to prepare and publish a complete catalogue of the species it contains.

The preparation of reports upon the marine invertebrate fishery industries and the fishing grounds of North America, including the correction of proofs of the same, has occupied much of the curator's time, but unavoidable delays prevented the issuing of any of these reports during 1884.

The collection of *Astacidæ* (cray-fishes) lent to Prof. Walter Faxon, of Harvard College, for study, in the winter of 1882-'83, was returned to the Museum in June last, fully identified. This collection is now one of the most complete in the world, especially as regards North American forms, containing 46 species (44 being North American), of which 9 are new to science, having been described by Professor Faxon during the year in the Proceedings of the American Academy of Arts and Sciences, Vol. XX. The total number of jars in the collection is 210, and of specimens 1,084, many of the species being represented from several localities.

Mr. John Murdoch, one of the naturalists of the U. S. Signal Service expedition to Point Barrow, Alaska, from 1881 to 1883, was engaged at the Smithsonian Institution during the winter and spring in working up the collection of marine invertebrates obtained by that expedition. This collection was found to contain 119 species, as follows: Pycnogonida, 2; Crustacea, 44, of which 7 are new; Vermes, 20, of which 1 is new; Echinodermata, 17; Anthozoa, 4; Hydrozoa, 17; Tunicata, 6; Brachiopoda, 1; Polyzoa, 5; and Porifera, 3. It is now in the possession of the Museum. A preliminary account of the new species has been presented for publication in the Proceedings of the Museum, and a complete report upon the collection is in the hands of the Public Printer, as part of the "Report of the International Polar Expedition to Point Barrow, Alaska, by First Lieut. P. H. Ray, Eighth Infantry, acting signal officer, commander of the expedition."

PRESENT STATE OF THE COLLECTIONS.

The collections belonging to this department are now in exceptionally good condition, although, from the want of sufficient storage space, they are not, for the most part, suitably arranged for convenience of reference. As above noted, materials have lately been received in such large quantities as to necessitate the constant attention of the small force assigned to this work in order to provide for their safety; and the careful preservation of specimens, rather than their scientific classification, has been the chief endeavor. Much has been accomplished, however, in the working up of certain portions of the collections, and as a large proportion of the materials turned in by the Fish Commission has passed through the hands of specialists, the scientific value of the collections now in the department is very great. Nearly all the specimens received have been catalogued in the record books, and of all properly identified collections card catalogues have been made and are arranged in systematic order.

Most of the alcoholic specimens are stored in the basement of the Smithsonian Institution. The small room in the west basement, originally assigned to this department, is now completely filled with jars and bottles, which not only occupy all the shelves and tables, but a large part of the floor space as well. Two series of cases in the hall adjoining this room are similarly filled with jars, while the floor of the hall is used for the storage of the large copper tanks. Another large series of cases in the main basement hall is occupied with jars belonging to this department, and also the wall cases in the southwest part of the bird hall, on the main floor. The west Smithsonian hall, formerly used for the exhibition of minerals and pottery, is now almost entirely taken up by this department, only a few of the larger pieces of pottery yet remaining. The old wall cases in this hall are now filled with the exhibition series of marine invertebrates, so far as it has been prepared; but it has been necessary to use the floor space and the tops of the cases for the storage of the dried specimens and some of the alcoholics, and for the working over of collections as they are received. This hall has, therefore, been closed to the public for over a year. The general collection of dried specimens is arranged in trays and boxes, partly stored in suitable cases, but for the most part piled up on the floor. This collection includes nearly all the groups of marine invertebrates, outside of the Mollusca, which permit of drying, and contains many valuable specimens. The dry sea-urchins, which have been completely worked up, are arranged in the trays fitting under the wall cases on the east side of the hall, and the collection of star-fishes occupies the similar trays on the west side.

The exhibition series has been temporarily arranged in natural sequence as regards the several groups displayed, beginning in the northeast corner of the room. The sponges come first, and are followed by the Hydroid corals, Actinian corals, Alcyonian corals, Ophiurans, Star-fishes, Sea-urchins, and Crustaceans. By far the greater space is occupied by the corals, which include nearly all the specimens saved from the collections of the United States Exploring Expedition and the North Pacific Exploring Expedition. As a whole the exhibition series presents a creditable appearance, and it should be opened to the public at as early a date as possible.

The total number of packages of specimens so far registered in this department is 20,279, but as to the number of species or specimens it is impossible at present to give any figures. A large number of the packages contain many, often several hundred, or, in the case of exceedingly small animals, even thousands of specimens, rendering it quite useless to attempt an enumeration.

The exhibition series contains the following number of specimens: Sponges, 283; Corals, 736; Ophiurans, 120; Star-fishes, 173; Sea-urchins, 207; Crustaceans, 74; Miscellaneous, 20; total, 1,613.

XII (A).—DEPARTMENT OF INVERTEBRATE FOSSILS, PALEOZOIC.

By C. D. WALCOTT, *Honorary Curator.*

ADDITIONS TO THE COLLECTIONS.

The most important addition is that of Devonian and Carboniferous fossils from the U. S. Geological Survey collections. Many of the specimens are types of new species, and the collection is the original one upon which the Paleontology of the Eureka District, Nevada, is based. (Monog. VIII, U. S. Geol. Surv.)

Another collection transferred from the Survey contains a valuable and extensive series from the Hamilton group at Moravia, N. Y.

Lists of the species in the above collections will be found in the appendix.

The smaller accessions are:

One block of Lower Carboniferous limestone with two beautiful specimens of *Scaphiocrinus* sp.? from Capt. George M. Wheeler, U. S. A.

From the Hamilton group at Widder, Ontario: Actinozoa, 16 species; Brachiopoda, 4 species; Gasteropoda, 1 species; Pteropoda, 1 species; Annelida, 1 species; received from Mr. C. D. Walcott.

By exchange with the Sayre Female Institute, of Lexington, Ky., the following species of fossils from the Hudson River group of Ohio and Kentucky were received:

Buthotrephis gracilis.
Climacograptus bicornis.
Crania scabiosa.
Orthis insculpta.
Strophomena alternata.
Strophodonta planumbona.
Trematospira quadriplicata.
Zygospira modesta.
Rhynchonella capax.
Cyclora minuta.
Murchisonia Bowdeni.

A return exchange was prepared of 14 species of Devonian and 15 species of Carboniferous fossils.

From Mr. L. A. Cox, of Keokuk, Iowa, a beautiful specimen of *Dorycrinus Mississippiensis* was received, and also casts of the following species of Crinoids from the Keokuk limestone:

Agaricocrinus Americanus.
Agaricocrinus Wortheni.
Barycrinus Hercules.
Barycrinus spurius.
Barycrinus tumidus.
Batocrinus biturbinatus.
Dorycrinus Mississippiensis.
Onychocrinus exculptus.
Synbathocrinus Swallovi.
Taxocrinus Wortheni.
Zeacrinus Coxanus.

A collection of Carboniferous fossils from Charles H. Townsend, Baird, Shasta County, California. This embraces 56 specimens, and is a desirable addition to the collection already in the Museum from that place, as no other locality of Paleozoic fossils is known on the Pacific coast.

A specimen of *Orthoceras* sp.? from the Coal Measures near Burlington, Kans., received from Mr. James B. Quil, of Burlington, Kans.

A fine specimen of *Productus semireticulatus*, from J. J. Watts, Peach Springs, West Tennessee.

One worn specimen of *Syringopora* sp.? (Carboniferous), a pebble in Paria River, Southern Utah, received from Mr. A. L. Siler, Hillsdale, Utah.

Received (accession No. 14347) from Mr. E. B. Knapp, of Skaneateles, N. Y., a collection comprising 14 genera, 17 species, of Devonian fossils, as per the following lists:

	No. of specimens.
Hamilton formation:	
Strophodonta concava, Hall	1
Strophodonta varistriata? Conrad	1
Rhynchonella (*L.*) *limitaris*, Vanuxem	3
Rhynchonella (*L.*) *quadricostatus*, Vanuxem	2
Athyris Cora, Hall	1
Atrypa reticularis, Linnæus	2
Microdon bellistriatus, Conrad	1
Modiomorpha concentrica, Conrad	2
Modiomorpha alta, Conrad	1
Grammysia subarcuata, Hall	1
Nyassa arguta, Hall	1
Paracyclas lirata, Conrad	1
Nuculites triqueter, Conrad	2
Nucula Randalli, Hall	1
Pleurotomaria sulcomarginata, Conrad	1
Pleurotomaria sulcomarginata (Morrisville, N. Y.)	1
Corniferous limestone:	
Strophomena rhomboidalis, Wahlenberg	1
Oriskany sandstone:	
Spirifera arenosa, Conrad	1
Miscellaneous U. S. National Museum accessions:	
Stromatopora? sp.? Upper Coal Measures, Pleasant Hill, Mo. From Mr. G. C. Broadhead, Pleasant Hill, Mo	3
14564. *Fusulina cylindrica*. A quantity of free specimens. From L. O. Perley, Emporia, Kans.	
14019. *Astylospongia præmorsa*. Niagara formation, Tennessee. From Mr. W. M. Clark, Nashville, Tenn	1
14309. *Illænus crassicauda*, var. Trenton limestone, Lexington, Va. From Mr. M. B. Harding, Lexington, Va	2
13966. *Scaphiocrinus*. Two beautiful specimens on one block. Crawfordsville, Ind. From Capt. George M. Wheeler, U. S. A.	
Microdiscus speciosus. Middle Cambrian, Troy, N. Y. From Mr. S. W. Ford, Schodack Landing, N. Y	2
Halysites catenulata, Linn. Drift of Park County, Indiana. From G. D. Lind, M. D., Danville, Ind	1
Obolella polita, Hall.	
Hyolithes primordialis, Hall.	

Ptychoparia? calymenoides, Whitfield.

Ptychoparia sp. ?

Agraulos Woosteri, Whitfield. Potsdam sandstone, Eau Claire beds, Dunn County, Wisconsin. From Public Museum of Milwaukee, Wis., by Mr. Carl Doerflinger, secretary.

Eurypterus remipes, De Kay. A very fine specimen. Waterlime group, Williamsville, N. Y. From Mr. James Temple Brown, U. S. National Museum.

Small miscellaneous collection:

Carboniferous. From Mr. William Kancher, Oregon, Holt County, Missouri.

WORK ON COLLECTIONS.

The direct work on the collections of the Museum has been the recording, identifying, and labeling of the material mentioned under accessions, and a continuation as opportunity offered of the arrangement of the old collections of the Smithsonian Institution. The latter work has been very limited, owing to the writer's position as paleontologist in charge of the Paleozoic paleontology of the U. S. Geological Survey, requiring him and his assistants to devote the most of their time to original work in connection with the Survey. This work will, in a large degree, inure to the benefit of the Museum collections, as the material studied contains many new types and large numbers of species illustrating the stratigraphic and geographic distribution of life during Paleozoic time.

RESULTS OF THE WORK ON THE COLLECTIONS FROM NEVADA, AS GIVEN IN MONOGRAPH VIII OF THE U. S. GEOLOGICAL SURVEY.

"As an assistant geologist in the field work, the writer collected most of the fossils *in situ*, and studied their mode of occurrence and stratigraphic relations, thus disposing of an element of uncertainty which frequently arises in the mind of the paleontologist when examining collections from a region unfamiliar to him, and which presents, in the strata of the lesser divisions of its great geologic series of rock, associations of species unknown elsewhere, or an unusual vertical range of individual species.

"The succession in the faunal series from the Olenellus (or Middle Cambrian) fauna, through a large, well-defined fauna of the character of that of the Potsdam group of New York and the Mississippi Valley, to one that in its assemblage of species combines both Cambrian and Silurian types, and passes upward into a fauna comparable to that of the Quebec group or the Calciferous and Chazy groups, is of special interest. The transition from the Cambrian to the Silurian fauna is very gradual, and such as would occur where there was no marked physical disturbance to influence the faunal change resulting from the natural dying out and development of species or the influx of new species from other areas.

"The fauna between that of the Silurian and the Devonian horizons is so meager that the only reference made to it is in the systematic list and in the lists of the geologic report. (Geology of the Eureka District.)

"The fauna of the Devonian is large and representative, notwithstanding some species have reversed their relative position in the group as they have been known heretofore, and others have a greater vertical range.

"The fauna of the White Pine shale, in the White Pine district, is in many respects a peculiar one, combining as it does species ranging from the Middle Devonian into the Lower Carboniferous. The stratigraphic position of the shale is at the summit of the Devonian system and at the base of the Carboniferous; it is overlain in the Eureka district, where the section is unbroken, by a massive belt of conglomerate before the limestones carrying the Lower Carboniferous fauna appear in the section. The most strongly marked Carboniferous species are *Spiriferina cristata*, *Retzia radialis*, *Athyris sublamellosus*, and *Cardiomorpha Missouriensis*. These are associated at the same horizon with such Devonian species as *Discina Lodensis*, *Productus subaculeatus*, *Ambocœlia umbona*, *Rhynchonella* (*Leiorhynchus*?) *quadricostata*, *Aviculopecten catactus*, and *Lunulicardium fragosum*.

"The White Pine shales occupy the same position with relation to the Devonian and the Carboniferous systems as does the lower portion of the Pogonip limestone to the Cambrian and Silurian systems. In each case there are beds of passage carrying a fauna that unites the faunas of the two systems.

"A summary of the Devonian fauna is given in the following table:

Groups.	Nevada.					Common to Nevada and			
						New York.		Falls of Ohio.	Iowa.
	Genera.	Species.	Lower Devonian.	Upper Devonian.	Upper and Lower Devonian.	Genera.	Species.	Species.	Species.
Porifera	3	3	3	1	1	2	....	....	....
Actinozoa	14	27	15	13	1	11	11	9	3
Polyzoa	2	3	3	....	....	2	....	....	1
Brachiopoda	26	*83	50	51	18	26	38	8	11
Lamellibranchiata	29	42	27	17	2	27	9	2	2
Gasteropoda	13	39	23	17	1	11	12	4	....
Pteropoda	5	8	7	2	1	5	5	....	....
Cephalopoda	4	11	7	4	....	4	....	....	....
Crustacea	2	2	2	....	....	2	....	....	....
Pœcilopoda	4	7	4	3	....	4	4	....	....
Total	102	225	141	108	24	94	79	23	17

* And five varieties.

"The Devonian corals, as well as those of the Silurian and Carboniferous, are not illustrated, and only short notes are given of a portion of the twenty-seven species occurring in the Devonian. From what is already known of this portion of the fauna there is little doubt but that future collections from the area of the Great Basin will give a very complete series of species, and still further increase the number of species common to the eastern and central (or Atlantic and Mississippi) areas and the western or Rocky Mountain area.

"The fauna of the Upper Carboniferous limestone is composed of old and well-known species usually occurring at that horizon, and gives but three species new to the region of the Rocky Mountains, viz, *Ptilodictya Carbonaria*, *P. serrata*, and *Macrodon tenuistriata*.

"There is a certain commingling of Upper Devonian species with the Lower Carboniferous fauna. We find *Discina Newberryi*, *Macrodon Hamiltonæ*, *Grammysia Hannibalensis*, *G. arcuata*, *Sanguinolites Æolus*, and *Pleurotomaria nodomarginata*, associated with common Carboniferous species.

"The discovery of Pulmoniferous mollusks of the genera Physa and Zaptychius in association with the fresh-water shell *Ampullaria Powelli* and fragments of a flora coniferous in character, supports the stratigraphic evidence of the presence of a near or not distant land area at the time of the deposition of the Lower Carboniferous rocks of Central Nevada. It also gives the first notice of the occurrence of the Pulmonifera in rocks of this age; the land shells of Nova Scotia and Illinois occur in the Coal Measures, and *Strophites grandæva*, Dawson, is from the Devonian plant beds of New Brunswick. The bearing of this discovery on the presence of land areas from the time of the Middle Paleozoic to the present is important. No other explanation offers than that there was a continuous fresh-water habitat, ponds or streams, which permitted the species to descend in a direct line from Paleozoic time to the present.

"The grouping of the genera and species in the strata is shown in a general manner in the systematic list at the end of this volume, and in greater detail in the abstract of a report on the geology of the Eureka district, Nevada, by Arnold Hague, contained in the Third Annual Report of the Director of the U. S. Geological Survey."

In the accompanying table the number of species known at present in the Paleozoic formations of Central Nevada is given:

Formation.	Genera.	Species.	Previously described species.	New species.	Unnamed species.	Recurrent species.
Cambrian	24	69	32	31	6	......
Silurian:						
Pogonip	47	90	34	31	34	15
Trenton, &c	14	15	4	......	11	......
Devonian	102	225	119	61	45	......
Carboniferous	65	132	53	50	29	3
Total	252	540	242	173	125	18
Recurrent species	8	18	18	......	......	......
Total	244	522	224	173	125	......

PRESENT STATE OF MUSEUM COLLECTIONS.

When the writer took charge of the collection of the Paleozoic invertebrate fossils, in the winter of 1883–'84, it was in seven table cases, and entirely without classification or arrangement. The first work was to remove the dust and dirt from a considerable portion of the collection that had not been cleaned, and then make a rough separation so as to group the specimens in their proper geological horizons—Cambrian, Silurian, Devonian, and Carboniferous, and into their zoologic groups within those horizons. This was done, and also all the accessions recorded and numbered that had been accumulating for a number of years. The old collections were then left for future study as each geologic fauna was taken up by the writer in connection with his work as paleontologist in charge of the Paleozoic paleontology of the U. S. Geological Survey.

As will be noticed under the head of accessions, large additions have been made to the collection, principally from the Geological Survey. This material is recorded, labeled, and can readily be placed on exhibition or referred to at once by students or other persons wishing to see it.

The collection is arranged in thirteen standard cases and in the laboratory storage cases, and is considered as a working collection not yet prepared for exhibition. When exhibition space is assigned and an assistant detailed to aid in the work an exhibition series of typical forms can soon be arranged. The total number of specimens is estimated to be about 73,000. This includes the Smithsonian collections, those of the various Government surveys up to the date of the organization of the present Survey, and the accessions recorded up to the present date, December 31, 1884.

In the following table is given the number of specimens in the Museum obtained from the great geologic groups. The figures represent the number of specimens of rock, not the number of fossils, as many blocks contain from two to fifty specimens of fossils each.

Statement showing the number of invertebrate Paleozoic fossils in the National Museum collections December 31, 1884.

Formation.	Office.	Court.	Total.
Cambrian	10,848		10,848
Silurian	2,499	9,919	12,418
Devonian	4,504	9,044	13,548
Carboniferous	5,657	28,031	33,688
Permian	1,892		1,892
Green's casts (plaster)		255	255
Total	25,400	47,249	72,649

Owing to the writer being engaged in field work during several months of the year, and the demands made by duties connected with the Geological Survey, it is impossible to give any considerable amount of time to labeling the old collection and preparing it for exhibition.

The administrative duties of the department are attended to, and all the office work of the writer and two assistants adds to the value of the collections, as the material worked over and studied is transferred when fully prepared to the Museum collections.

RECOMMENDATIONS.

It is respectfully suggested that provision be made by the Museum for the employment of an assistant, who shall be engaged in work connected with the Paleozoic collections of fossils. It is required, in order to put the old collections on exhibition and to record and take care of the accessions.

APPENDIX I.

Lists of the species transferred from the U. S. Geological Survey.

	No. of specimens.
DEVONIAN.	
Brachiopoda.	
Lingula Alba-pinensis, Walcott	6
Læna, Hall	1
Ligea, Hall	1
Ligea, Hall, var. *Nevadensis*, Walcott	3
Lonensis, Walcott	2
Melie, Hall	4
Whitei, Walcott	4
Sp.?	1
Discina Lodensis, Hall	12
minuta, Hall?	4
Sp.?	1
Pholidops bellula, Walcott	4
quadrangularis, Walcott	1
Chonetes deflecta, Hall	66
filistriata, Walcott	23
hemispherica, Hall	7
macrostriata, Walcott	30
mucronata, Hall	2
setigera, Hall	7
Sp.?	....
Leptæna sp.?	....
Productus (*P.*) *Hallanus*, Walcott	9
hirsutiforme, Walcott	35
lachrymosa, var. *lima* (Conrad) Hall	18
navicellus, Hall	19
lachrymosa, var. *stigmata*, Hall	16
Shumardianus, Hall	16
Shumardianus, var. *pyxidatus*, Hall	7
speciosus, Hall	25
subaculeatus, Murch	44
truncatus, Hall	5
Sp.?	1
Orthis impressa, Hall	93
McFarlanei, Meek	10
Tulliensis, Hall	31
Vanuxemi, Hall	11
Skenidium Devonicum, Walcott	1
Streptorhynchus Chemungensis (Conrad), Hall	10
Streptorhynchus Chemungensis, var. *Pandora*, Bill	36
Streptorhynchus Chemungensis, var. *perveta*, Hall	36
Strophomena rhomboidalis, Wilckens	18
Strophodonta arcuata, Hall	2
Calvini, Miller	13
canace, H. & W	6
demissa (Conrad) ? Hall	25
hemispherica, Hall	3
inequiradiata, Hall	60
Patersoni, Hall	4
perplana, Conrad (Hall)	7
punctulifera (Conrad) Hall	5
(miscellaneous)	6

	No. of specimens.
DEVONIAN—Continued.	
Brachiopoda—Continued.	
Spirifera Alba-pinensis, H. & W	1
disjuncta, Sowerby	26
Englemani, Meek	11
glabra, var. *Nevadensis*, Walcott	17
Parryana, Hall?	5
Pinonensis, Meek	53
raricosta (Conrad) ? Hall	20
strigosus, Meek, *S. disjuncta* De Verneuil	8
subumbona, Hall	......
(*M.*) *Maia*, Billings	67
varicosa, Hall	1
undifera, Roemer	26
undifera, var. *setigera*, Hall	1
Sp.?	5
Spiriferina cristata, Schlotheim	1
Ambocœlia umbonata, Conrad	7
Cyrtina Davidsoni, Walcott	2
Hamiltonæ, Hall	1
Nucleospira concinna, Hall	2
Trematospira infrequens, Walcott	1
Retzia radialis, Phillips	8
Athyris angelica, Hall	34
Sp.?	1
Meristella nasuta, Conrad	11
Atrypa desquamata, Sowerby	7
reticularis (Linn.) Dalman	107
Rhynchonella castanea, Meek	87
duplicata, Hall	30
Emmonsi, H. & W	1
Horsfordi, Hall	7
pugnus, Martin	24
occidens, Walcott	12
quadricostata, Vanuxem	50
Tethys, Billings	6
Laura, Billings	50
(*L.*) *Nevadensis*, Walcott	16
(*L.*) *sinuatus*, Hall	35
Leptocœlia sp.?	2
Pentamerus comis, Owen	66
Lotis, Walcott	18
Tropidoleptus carinatus, Hall	3
Cryptonella ? *circula*, Walcott	5
Pinonensis, Walcott	1
Sp.?	1
Terebratula sp.?	7
Number of species, 80; number of specimens, 1,549.	
Lamellibranchiata.	
Aviculopecten ? *catactus*, Meek	40
Pterinopecten sp.?	1
Glyptodesma sp.?	5
Pterinea Newarkensis, Walcott	2
flabella, Conrad	6
Actinoptera Boydii, Conrad	1
Leiopteria Rafinesqui, Hall	8

	No. of specimens.
DEVONIAN—Continued.	
Lamellibranchiata—Continued.	
Leptodesma transversa, Walcott	1
Limoptera sarmenticia, Walcott	5
Mytilarca dubia, Walcott	4
Chemungensis, Conrad	1
Sp.?	2
Plethomytilus oviformis, Conrad	1
Modiomorpha altiforme, Walcott	6
oblonga, Walcott	1
obtusa, Walcott	2
Goniophora perangulata, Hall	3
Palæoneilo sp.?	1
Nucula Rescuensis, Walcott	4
Sp.?	2
noticia, Hall	4
Nuculites triangularis, H. & W	1
Dystactella insularis, Walcott	1
Megambonia occidualis, Walcott	2
Nyassa parva, Walcott	6
Grammysia minor, Walcott	4
Edmondia Pinonensis, Meek	21
Cardiomorpha Missouriensis, Shumard	5
Sanguinolites rigidus, White & Whitfield	2
Sanduskyensis, Meek	1
ventricosus, White & Whitfield	1
Combensis, Walcott	1
gracilis, Walcott	3
Conocardium Nevadensis, Walcott	3
Sp.?	5
Lunulicardium fragosum, Meek	37
Paracyclas occidentalis, Hall	21
peroccidens, H. & W	3
Posidonomya Devonica, Walcott	1
lævis, Walcott	1
Microdon macrostriata, Walcott	8
Anadontopsis amygdalæformis, Walcott	11
Cypricardinia indenta, Conrad (sp.)	4
Schizodus (*Cytherodon*) *orbicularis*, Walcott	2
Number of species, 38; number of specimens, 240.	
Gasteropoda.	
Platyceras carinatum, Hall	7
conicum, Hall	2
Conradi, Walcott	3
dentalium, Hall	1
nodosum, Conrad	4
thetiforme, Walcott	2
Thetis, Hall	3
undulatum, Walcott	1
Sp. undt	10
Platyostoma lineata, Conrad	18
Sp.?	2
Ecculiomphalus Devonicus, Walcott	4
Euomphalus Eurekensis, Walcott	12
(*P.*) *laxus*, Hall	5
(*P.*) *luxus*, White	5
Sp.?	14
Straparollus Newarkensis, Walcott	3
Cyclonema (like *C. multilira*, Hall)	11
Pleurotomaria sp.?	8
Platyschisma? ambiguum, Walcott	4
McCoyi, Walcott	12
Sp.?	1
Callonema occidentalis, Walcott	5
Sp.?	1
Callonema?	1

	No. of specimens.
DEVONIAN—Continued.	
Gasteropoda—Continued.	
Loxonema approximata, Walcott	7
Eurekensis, Walcott	10
nobilis, Walcott	10
Sp.?	24
Bellerophon Combsi, Walcott	7
Leda, Hall	7
Lyra, Hall	3
Mæra, Hall	12
Neleus, H. & W	5
Pelops, Hall	1
perplexa, Walcott	15
Scoliostoma Americana, Walcott	27
Naticopsis (like *N. æquistriata*)	1
Sp.?	6
Metoptoma? Devonica, Walcott	1
Number of species, 40; number of specimens, 275.	
Pteropoda.	
Tentaculites attenuatus, Hall	2
bellulus, Hall	2
gracilistriatus, Hall	8
scalariformis, Hall	10
(Sp. undt.)	9
Styliola fissurella, Hall	45
Conularia sp.?	3
Coleolus lævis, Walcott	7
Sp.?	18
Hyolithes (like *H. Aclis*, Hall)	1
Sp.?	2
Number of species, 11; number of specimens, 107.	
Cephalopoda.	
Orthoceras sp.? (5 species)	44
Gomphoceras suboviforme, Walcott	1
Sp.?	3
Cyrtoceras cessator, H. & W	1
Nevadense, Walcott	1
Sp.?	1
Gyroceras sp.?	3
Goniatites desideratus, Walcott	2
Kingi, H. & W	22
(like *G. discoideus*, Hall)	3
Number of species, 14; number of specimens, 81.	
Crustacea.	
Beyrichia occidentalis, Walcott	2
Leperditia rotundata, Walcott	8
Sp.?	13
Number of species, 3; number of specimens, 23.	
Pœcilopoda.	
Phacops rana (Green) Hall	50
Dalmanites Meeki, Walcott	26
Sp.?	4
Prœtus Haldemanni, Hall	13
marginalis (Conrad) Hall	14
Sp.?	10
Phillipsia ornata, Hall?	4
Number of species, 7; number of specimens, 121.	

From the Carboniferous the record shows 103 species and 1,627 specimens.

	No. of specimens.
CARBONIFEROUS.	
Brachiopoda.	
Discina connata, Walcott	4
Newberryi, Hall	30
Newberryi, Hall ?	7
nitida, Phillips	5
Sp. ?	1
Lingula mytiloides, Sowerby ?	6
Chonetes granulifera, Owen	81
Verneuiliana, N. & P	8
Productus Cora, D'Orb	57
costatus, Sowerby	4
costatus, var. ? Sowerby	9
elegans, McCoy	5
longispinus, Sowerby	18
punctatus (Martin)	20
semireticulatus (Martin) De Koninck	20
subaculeatus, Murch	14
several sp. ?	50
Streptorhynchus crenistria (Phillips) Davidson	25
Orthis Pecosi, Marcou	25
resupinata (Martin) De Koninck	44
Spirifera annectans, Walcott	1
camerata, Martin	31
desiderata, Walcott	1
trigonalis (Martin) Sowerby	7
Leidyi, N. & P	14
neglecta, Hall	12
Rockymontana, Marcou	34
striata, Martin	19
young shells	17
(*Martinia*) *setigera*, Hall	23
Syringothyris cuspidatus (Martin) King	12
Spiriferina cristata, Schlotheim	35
Retzia radialis, Phillips	60
Verneuiliana, Hall	30
Athyris Roysii (L. Eveille) McCoy	5
sublamellosa, Hall	43
subtilita (Hall) Newberry	26
Sp. ?	3
Rhynchonella Eurekensis, Walcott	48
Thera, Walcott	18
Utah, Marcou	21
Sp. ?	2
Camarophoria Cooperensis, Shumard	28
Terrebratula bovidens, Martin	4
hastata, Sowerby	48
2 sp. ?	21
Number of species, 38; number of specimens, 941.	
Lamellibranchiata.	
Aviculopecten affinis, Walcott	102
Eurekensis, Walcott	5
Haguei, Walcott	4
peroccidens, Walcott	13
Pintoensis, Walcott	2
2 sp. ?	10
Streblopteria similis, Walcott	24
Crenipecten Hallanus, Walcott	7
Pterinopecten Hoosacensis, Walcott	2
Spio, Walcott	5
Pterinea Pintoensis, Walcott	2
Leptodesma 2 sp. ?	5
Ptychopteria protoforme, Walcott	1
Pinna consimilis, Walcott	9
inexpectans, Walcott	9
Myalina congeneris, Walcott	5
Nemesis, Walcott	3
Nessus, Walcott	3
Modiola Nevadensis, Walcott	4
Modiomorpha ambigua, Walcott	1
desiderata, Walcott	3
Pintoensis, Walcott	15
Nucula insularis, Walcott	10
levatiforme, Walcott	4
2 sp. ?	7
CARBONIFEROUS—Continued.	
Lamellibranchiata—Continued.	
Solenomya curta, Walcott	3
Macrodon Hamiltonæ, Hall	32
truncata, Walcott	2
tenuistriata, Meek & Worthen	1
Grammysia Hannibalensis, Shumard	16
arcuata, Conrad	5
Edmondia Medon, Walcott	9
? *circularis*, Walcott	1
Pleurophorus Meeki, Walcott	2
Sanguinolites Æolus, M. & W	80
? *Nænia*, Walcott	1
retusus, Walcott	3
Salteri, Walcott	1
simplex, Walcott	1
striata, Walcott	4
? 3 sp. ?	4
Microdon (*Cypricardella*) *connatus*, Walcott.	4
Cardiola ? *filicostata*, Walcott	1
Schizodus cuneatus, Meek	7
curtiforme, Walcott	4
deparcus, Walcott	1
Pintöensis, Walcott	8
Number of species, 42; number of specimens, 445.	
Gasteropoda.	
Platyceras occidens, Walcott	2
Piso, Walcott	1
Platyostoma inornata, Walcott	1
Euomphalus subrugosus, M. & W	1
Loxonema bella, Walcott	1
sp. ?	1
Machrocheilus, sp. ?	1
Pleurotomaria Eurekensis, Walcott	10
nodomarginata, McChesney	4
3 sp. ?	15
Naticopsis 2 sp. ?	4
Bellerophon majuscula, Walcott	11
textilis, Hall	10
2 sp. ?	8
Metoptoma peroccidens, Walcott	2
Ampullaria ? Powelli, Walcott	Many
Number of species, 11; number of specimens, 72.	
Pulmonifera.	
Zaptychius Carbonaria, Walcott	Many
Physa prisca, Walcott	Many
Number of species, 2.	
Pteropoda.	
Conularia Missouriensis, Shumard	1
Hyolithes Carbonaria, Walcott	2
Dentalium (like *D. Primarium*), Hall	8
Number of species, 3; number of specimens, 11.	
Cephalopoda.	
Orthoceras Eurekensis, Walcott	3
annulatocostata, M. & W	6
2 sp. ?	3
Gomphoceras sp. ?	2
Nautilus (like *N. Digonus*, M. & W.)	2
Goniatites sp. ?	1
Number of species, 5; number of specimens, 17	
Crustacea.	
Leperditia sp. ?	11
Number of species, 1; number of specimens, 11.	
Pœcilopoda.	
Griffithides Portlocki, M. & W	140
Number of species, 1; number of specimens, 140.	

Devonian fossils from the Hamilton group at Moravia, N. Y., transferred from the U. S. Geological Survey:

	No. of specimens.
DEVONIAN.	
Actinozoa.	
Streptelasma rectum, Hall	53
Chætetes furcatus, Hall	8
fruticosus, Hall	87
Number of species, 3; nnmber of specimens, 93.	
Echinodermata.	
Platycrinus Eboraceus, Hall	4
Crinoid stems	16
Number of species, 2; number of specimens, 20.	
Polyzoa.	
Polyzoa sp.?	39
Number of species, 1; number of specimens, 39.	
Brachiopoda.	
Lingula Ligea, Hall	8
sp.?	2
Discina media, Hall	8
sp.?	8
Pholidops Hamiltonæ, Hall	25
Chonetes coronata, Hall	6
lepida, Hall	6
muricata, Hall	16
scitula, Hall	50
sp.?	8
Productus Shumardianus, Hall	7
Orthis Vanuxemi, Hall	55
Strophodonta concava, Hall	9
demissa, Conrad	2
inequistriata, Conrad	17
perplana, Conrad	7
textilis, Hall	11
Spirifera acuminata, Conrad (Cooperstown, N. Y.)	2
fimbriata, Conrad	18
granulifera, Conrad	46
medialis, Hall	52
mucronata, Conrad	76
Tullia, Hall	8
Ambocœlia umbonata, Conrad	50
Athyris spiriferoides, Eaton	48
Atrypa reticularis, Linnæus	56
var. *spinosa*, Hall	5
Rhynchonella Horsfordi, Hall	1
multicostata, Hall	8
Rhynchonella subcuboides, Hall	83
Sp.?	4
Tropidoleptus, Conrad	25
Cryptonella Eudora, Hall (Ithaca, N. Y.)	15
Number of species, 32; number of specimens, 747.	
Lamellibranchiata.	
Aviculopecten Ida, Hall	1
mucronatus, Hall	1
Phorcus, Hall	1
princeps, Conrad	5
scabridus, Hall	17
Sp.?	4
Actinopteria subdecussata, Hall	1
Pterinopecten exfoliatus, Hall	2
exfoliatus?	1
Pterinopecten?	2
DEVONIAN—Continued.	
Lamellibranchiata—Continued.	
Glyptodesma erectum, Conrad	2
Pterinea flabella, Conrad	2
Leiopteria sp.?	5
Mytilarca (P.) oviformis, Hall	2
Modiomorpha alta, Conrad	1
complanata, Hall	21
concentrica, Conrad	33
Sp.?	1
Goniophora Hamiltonensis, Hall	5
rugosa, Conrad	3
Palæoneilo constricta, Conrad	98
emarginata, Conrad	3
maxima, Conrad	4
muta, Hall	7
plana, Hall	30
Sp.?	1
Nucula bellistriata, Conrad	9
corbuliformis, Hall	11
lirata, Conrad	24
Randalli, Hall	2
Nuculites Nyassa, Hall	10
oblongata, Hall	28
triqueter, Conrad	20
Leda diversa, Hall	20
rostellata, Hall	2
Grammysia arcuata, Conrad	5
lirata, Hall	2
Edmondia Philipi, Hall	1
subnasuta, Hall	1
Cardiomorpha bellatula, Hall	1
Sanguinolites cuneatus, Conrad	1
Lunulicardium fragile, Hall	5
Paracyclas tenuis, Hall	8
Macrodon Hamiltonæ, Hall	2
bellistriatus, Conrad	28
tenuistriata, Hall	1
Prothyris lanceolata, Hall	4
Modiella pygmæa, Conrad	1
Tellinopsis emarginata, Conrad	46
Cimataria recurva, Hall	2
Phthonia sectifrons, Conrad	5
Orthonata parvula, Hall	5
Schizodus appressus, Conrad	3
Number of species, 53; number of specimens, 482.	
Gasteropoda.	
Platyceras carinatum, Hall	1
erectum, Hall	4
Platyostoma lineatum, Conrad	2
Pleurotomaria capillaria, Conrad	16
Itys, Hall	11
trilix, Hall	2
Loxonema delphicola, Hall	3
Hamiltonensis, Hall	7
Bellerophon Leda, Hall	11
crenistria, Hall	2
patulus, Hall	14
Cyrtolites mitella, Hall	2
Number of species, 11; number of specimens, 75.	
Pteropoda.	
Tentaculites scalariformis, Hall	1
Hyolithes aclis, Hall	5
aclis, var. *petaloidæ*, Hall	2
striatus, Hall	1
Sp.?	2

	No. of specimens.
DEVONIAN—Continued.	
Pteropoda—Continued.	
Coleolus tenuicinctum, Hall	4
Conularia undulata, Conrad	1
Number of species, 6; number of specimens, 16.	
Cephalopoda.	
Orthoceras crotalum, Hall	10
nuntium, Hall	10
subulatum, Hall	5
Telamon, Hall	2
Sp. ?	26
Goniatites discoideus, Hall	8
DEVONIAN—Continued.	
Cephalopoda—Continued.	
Goniatites Sp. ?	4
Nautilus liratus, var. *juvenis*, Hall	1
Number of species, 8; number of specimens, 66.	
Pœcilopoda.	
Phácops rana, Green	30
Dalmanites Boothii, Green	13
Homalonotus DeKayi, Green	2
Slickensides	16
Number of species, 4; number of specimens, 61.	

Genera, 65; species, 120; specimens, 1,599.

The above collection will be of value in the comparative study of faunas from the Devonian, as it is from one locality and shows variations in the species not observed elsewhere.

"The general character of the fauna of the Cambrian, Silurian, Devonian, and Carboniferous strata of the Eureka and White Pine mining districts of Central Nevada is given in this work more to illustrate the stratigraphic succession and equivalency of the geologic horizons with those described elsewhere than as a detailed monograph of the invertebrate fossils, since for the latter purpose much more extensive collections are necessary to represent the large fauna of the Paleozoic system of Central Nevada than we have at present."

XII (B).—DEPARTMENT OF INVERTEBRATE FOSSILS, MESOZOIC AND CENOZOIC.

By C. A. WHITE, *Honorary Curator.*

This report necessarily embraces an account of a large part of the work which has been done by my division of the U. S. Geological Survey, because myself and all of my assistants except one are regularly employed as members of that organization; also much the greater part of the material which is now being received for this division of the Museum comes from parties connected with the Survey.

Besides myself, the following persons connected with the Survey have been employed in my division of the Museum work during the year: J. B. Marcou, Lawrence C. Johnson, Frank Burns, P. C. George, J. P. Hendley, and C. B. Boyle. In addition to these, Dr. R. H. Singleton has been detailed from the Museum for work in connection with the registers and catalogues. It will of course be understood that for a part of the year the persons mentioned above who are connected with the Survey are not engaged upon Museum work. All of them spend more or less of the year in the field work of the Survey, and some of them are engaged mainly in the collection of fossils, which are sent to the Museum.

ACCESSIONS.

There have been received at the Museum during the past year about 85 boxes of fossils which pertain to my division, the number being somewhat indefinite because many of the boxes which are sent contain material which pertains to other divisions. These accessions embrace collections made in California, Oregon, New Jersey, Florida, Alabama, and Mississippi.

As is usually the case with such collections, a part of the material is not available for Museum purposes; but still these accessions are making large additions to the Museum material of a very important character. These new collections also embrace species which have not before been in the possession of the Museum. This is especially the case with the collections from California and the Gulf States.

Fifteen accessions sent by private parties to the Museum have been received by my division during the year. Most of these are of little value as accessions, but a part of them are desirable. They have, however, all received proper attention, as required by the rules of the Museum.

ROUTINE WORK.

Besides the work of classifying and arranging the collections, the routine work of my division has consisted largely in duplicating the registers and the preparation of catalogues. Copies of the three large volumes of the registers have been made, consisting of 3,500, 8,899, and 12,900 entries, respectively. These copies have been delivered to Mr. C. D. Walcott, who has charge of the Paleozoic fossils.

A complete index of all the Mesozoic and Cenozoic invertebrate fossils of North America, wherever published, is in an advanced state of preparation, and it is expected that it will be ready for publication during the year.

A catalogue of all the type specimens of the Mesozoic and Cenozoic species belonging to the Museum is nearly completed, and will soon be offered for publication in the Proceedings of the Museum. It is based upon a careful selection and verification of the specimens, and will show the Museum registry number of each, as well as the date and place of description and illustration.

The reviewing and labeling of all the fossils belonging to this division, exclusive of the later collections of the Geological Survey and the 49 boxes sent last year from Texas by Mr. George Stolley, have been completed. The Stolley collection has been unpacked, a few trays full selected for the Museum, and the remainder stored in the Armory building.

The entries in the Museum register for the year range from 12,231 to 13,389, inclusive.

A collection of Mesozoic and Cenozoic fossils, consisting of 100 species, has been sent to Prof. Samuel Calvin, of the Iowa State University, in exchange for fossils received from him by the Museum a year or two previously. A collection of 18 specimens of fossiliferous rocks have been delivered to Mr. George P. Merrill, in charge of the Department of Lithology in the Museum.

PRESENT STATE OF THE COLLECTIONS.

It is not at present practicable to make any satisfactory statement as to the present state of the collections, because, for want of sufficient help and suitable room in which to work, they have not been fully classified, and none of them are yet installed. Upon the completion of the study of any collection or group of species the specimens have been put away in trays, where they await an opportunity for their classification and installation.

Speaking in a general way, I may say that the collections contain a large part of the types of the species of fossil invertebrates which have been published in the official reports of the United States surveys and explorations. A few of these have perhaps been lost, and some have never reached the Museum. They also contain so large a number of authentic specimens of other species, that resort to the other great collections of the country is seldom necessary, so far as North American forms are concerned.

The collections that are now being added to the Museum, together with those which it already possesses, are to be the standards of reference for the national geological work, and it is therefore essential that provision be made for their safety and accessibility. The Museum work of my division is very much retarded for want of suitable room in which to work and suitable cases in which to arrange the specimens. So great is the want in this respect that we often find it impracticable to get access to the material which it is necessary to study; and the collections are also inaccessible to other naturalists who may desire to study them. Convenient access at all times to the collections is necessary, because questions are constantly arising in the progress of the Government geological work which can be solved only by their aid. It may be mentioned, however, as an encouraging fact, that the more important part of the collections is comparatively safe, so far as danger of their destruction is concerned.

XIII.—DEPARTMENT OF FOSSIL PLANTS.

By LESTER F. WARD, *Honorary Curator.*

Only a few scattering accessions have been made to the department during the year, and no work strictly appertaining to the curatorship was undertaken until after the beginning of November, owing to my not having any assistants and to being constantly employed in the preparation of reports for the Geological Survey. The material which I am elaborating for these reports will, however, be ultimately turned over to the Museum, and will largely increase its collections.

On November 5, Mr. Frank H. Knowlton was assigned to duty in the Department of Fossil Plants, and since that date he has been employed in devising and perfecting a system of cataloguing and installing the accessions. A large amount of miscellaneous and undetermined material had accumulated which it had been impossible for me to attend to, and this he has carefully and intelligently examined, classified, and catalogued. This material, therefore, I am now able, for the first time, to embrace in my enumeration of stock in hand. Mr. Knowlton has also performed a large number of minor duties incident to the routine work of the department which had been deferred for want of time, and is intrusted with the care of specimens as they arrive, and with all clerical work, which I hope may hereafter be attended to without delay.

Mr. A. L. Schott, formerly of the Botanic Garden, who has been employed in the Museum to attend to the palms and other ornamental plants in the rotunda and on the adjacent balconies, was also assigned to my department early in November, and the permission given me to command his services during such portion of the time as they were not required in the care of the plants intrusted to his charge. The great need I was laboring under of specimens of living plants for comparison with fossil impressions, coupled with Mr. Schott's peculiar fitness for collecting the exotic plants of the parks, streets, and greenhouses of the city, determined me to intrust him with the duty of making such a collection. It gives me pleasure to testify to the intelligent and satisfactory manner in which he has performed this duty. The specimens he daily brings, and which are carefully dried and preserved, represent species from all parts of the world, and especially from the tropics and the Southern Hemisphere, and they therefore constitute a most valuable basis for the study of Miocene fossil plants, which usually possess so little analogy with the floras of north temperate latitudes. It is to be regretted that Mr. Schott's work was begun so late that few of the hardy exotics of the parks and streets could be obtained before the advent of frosts; but it is hoped that this work may be resumed and completed next season.

The following was the state of the collections at the close of the year:

1.	Total number of specimens of catalogued material (exclusive of my recent collections still in hand for study and not yet formally turned over to the National Museum)	7,291
2.	Specimens in the Museum, but which have not been specifically determined, and consisting to a great extent of silicified wood, petrified stems, trunks, &c.	2,270
3.	Determined material	5,021
4.	In the reserve series, many of which, however, are duplicates and can ultimately be used for purposes of exchange	3,930
5.	Duplicates specially selected as such and now stored at the Armory Building.	1,091
6.	Number of distinct species identified, catalogued, and installed	923
7.	Of which Paleozoic, chiefly Carboniferous	272
8.	Cretaceous, chiefly Dakota group	142
9.	Tertiary and Laramie group, largely the latter, which were classed as Eocene in the catalogue prepared by Mr. Lesquereux	509

It is, perhaps, too early to speak of the proposed new department of botany which I learn is about to be established in the Museum and placed under my immediate charge, but I cannot repress my great satisfaction at such a step, and I desire to assure you of my hearty cooperation in making it a complete success.

XIV.—DEPARTMENT OF MINERALOGY.

By F. W. CLARKE, *Honorary Curator.*

During the year the growth of the mineral collection has been steady and encouraging. Material of great value has been received from many sources, the work of installing the collection has been definitely begun, and a system of exchanges has been fairly inaugurated. In connection with my duties as chief chemist of the U. S. Geological Survey, I have been able to institute some scientific investigations upon minerals collected in the field, and similar work has also been carried forward by certain of my assistants.

A list of all the accessions to the mineral collection during 1884 would be too bulky for publication, but a brief *résumé* of the more notable ones may be interesting. The first place must be given, both by merit and in courtesy, to the admirable suite of American minerals loaned to the Museum by Mr. Joseph Willcox, of Media, Pa. This collection numbers some 1,400 specimens, and fills the equivalent of six large sloping-top cases of three shelves each. It is remarkably rich in quartzes, rutiles, corundums, feldspars, amphiboles, pyroxenes, micas, tourmalines, pyrophyllites, apatites and danburites, and in some of its series it could hardly be paralleled. Next in importance is the Abert collection, which, made by Col. J. J. Abert, was presented to the Museum by his son, J. T. Abert, and contains 1,245 specimens. It was particularly rich in foreign material, and filled many serious gaps in the Museum series.

To Prof. S. F. Peckham of Minneapolis, Minn., we are indebted for a handsome group of cut specimens of pebbles of thomsonite from Minnesota. From Mr. J. D. Schreiber of Shimersville, Pa., we received a large, fine crystal of corundum, together with several smaller ones, all of them from Shimersville. From Mr. Richard Pearce of Argo, Colo., we received a number of rare arsenates and phosphates of copper from the American Eagle Mine, Utah. Another lot of this material was collected for this department, last summer, by Mr. F. P. Dewey, Curator of the Department of Metallurgy.

Another large group of accessions is attributable to the appropriation made for the Museum exhibit at the New Orleans Exposition. A part of this appropriation was allotted to the mineral department for the purchase and collection of specimens, with very favorable results. Instead of attempting a general display of minerals it was thought best to take up one special class, and the class chosen for exhibition was that of "gems and ornamental stones." The schedule which was adopted included all the gems proper, rock crystal, agates and jaspers, malachite, lapis lazuli, jet, meerschaum, amber &c.; and every important gem or ornamental species was secured both in the rough and cut conditions. About one thousand specimens of this class are now on exhibition in New Orleans, of which nearly or quite one-third are cut and polished stones. Educationally, the gem collection is practically complete, and needs only to be improved by the addition of minor varieties or the replacement of small specimens by better ones. A part of this collection was shown at the Cincinnati Exposition in September.

In connection with the New Orleans work, two important field expeditions were made by Mr. W. S. Yeates. In his first trip, he visited the mineral region of Northern New York, and secured valuable material at Antwerp and Gouverneur. The suite of minerals from the Sterling iron mine at Antwerp is exceptionally fine and complete. To the liberality of Mr. E. B. Bulkley, president of the Jefferson Iron Company at Antwerp, the Museum is indebted for nearly all of these specimens, a few having been secured from other parties by exchange. The millerites, siderites and chalcodites of this series are especially good, several handsome specimens of white siderite being included. Interest in the growth of the Museum was exhibited, in a practical way, by Mr. W. H. Andrews of Gouverneur, who generously contributed quite a number of specimens from his private collection, including not only the minerals from St. Lawrence County, but also some from various other localities. Exceptionally good crystals of selenite from Grand Rapids, Mich., a specimen of whitneyite from Lake Superior, a specimen of crystallized white tourmaline from De Kalb, N. Y., a number of good crystals of black tourmaline from Pierrepont, N. Y. and a very large crystal of brown tourmaline, with perfect faces, from Gouverneur, were among the most important contributions made by Mr. Andrews. The Museum is also under obligations to Messrs. John D. Swan and R. S. Hodge, of Antwerp, and Messrs. John Webb, F. Lavack and O. P. Fuller, of Gouverneur.

In his second trip, Mr. Yeates visited the Hot Springs of Arkansas, where he obtained good series of quartz crystals, wavellites, variscites, brookites, rutiles &c. During this trip, he also went to Mine La Motte, in Missouri, securing a quantity of linnæite, some exceptionally fine marcasite, and other good material. Thanks are due to Messrs. J. W. Neill, J. D. Sanders and B. Colman, and to Mrs. A. J. Beardsley, for most of the specimens collected at Mine La Motte. Both expeditions were so successful as to justify me in urging that the practice of field collection should be systematically encouraged, and that each year collectors should be sent out to visit mineral localities. The expense of such work is trifling in comparison with the results to be attained.

In connection with my work in the Geological Survey I myself made two expeditions into the field—first, to the tourmaline region of Western Maine, and, second, to the feldspar quarries near Middletown, Conn.; and both trips yielded good material for the Museum. Assistant Chemist T. M. Chatard also went twice to the corundum fields of North Carolina and brought back good collections. Part of the latter have already been turned over to the Museum and part have been reserved for laboratory investigations. Minerals have also been received from other Geological Survey parties, and notably from Messrs. J. B. Marcou, C. D. Walcott, and J. S. Curtis. Mr. Marcou, in particular, obtained for the Museum a large number of specimens of the vivianite from Mullica Hill, N. J.; and Mr. Whitman Cross sent in a collection of the zeolites from Table Mountain, Colorado, and the cryolite minerals found near Pike's Peak.

Early in the year our exchange system began to bear fruit, and the following are among the more noteworthy accessions derived from this source: From N. H. Perry, of South Paris, Me., we received a collection of the lepidolites, tourmalines, &c., of Auburn, Me., the topaz and associated minerals of Stoneham, Me., the cancrinite and sodalite from Litchfield, Me., and other material from the same region; from E. M. Bailey, Andover, Me., a collection of the lepidolite, &c., from the new locality on Black Mountain, in Rumford, Me.; from Prof. W. N. Rice, of Wesleyan University, a fine series of the minerals found in the feldspar quarries near Middletown, Conn.; from G. F. Kunz, a very full set of the rarer titanium minerals of Magnet Cove, Ark.; from J. Siemachko, St. Petersburg, a number of rare Russian minerals; and from Ward & Howell, of Rochester, N. Y., a number of valuable specimens, representing various localities, among them a good specimen of Japanese stibnite. Still other exchanges have been arranged for, but the collections have not yet been actually received.

Our meteorite collection is small as yet, but has shown some growth during the year. From Dr. J. Berrien Lindsley, of Nashville, we have received a fine slice of the meteoric iron from Robertson County, Tennessee. We have also obtained, by exchange, cuttings of the Dalton, Ouachita and Tazewell irons, and meteoric stones from the Iowa County, Mocs and Pultusk falls. The large meteoric iron, weighing 52 kilograms, recently discovered at Grand Rapids, Mich., has been, through the kindness of Prof. J. R. Eastman, deposited in the Museum for exhibition and description.

In April the work of installing the mineral collection was begun in the west-south range, but was soon interrupted by the labors involved in preparation for the New Orleans Exposition. The Willcox collection, however, has been arranged and labeled, and 1,655 specimens of the Museum collection proper are now on view. The plan of arrangement may be briefly stated as follows: A specimen, when received and catalogued, is assigned to either the exhibition or study series or placed among the duplicates. The latter are kept in drawers in the work-room on the third floor of the southwest pavilion, and need no further mention here. The exhibition series is displayed in sloping-top cases of three shelves each, and these are placed upon cases of drawers containing the study series. The classification is essentially according to Dana's system, slightly modified; and the purpose is to have the same case, above and below, contain the same group of minerals. For example, our finest micas or calcites would be shown in the exhibition series, while immediately below them, in unit case drawers, would be as wide a range of the same species as possible for exhaustive monographic study. Under this policy the bulk of our collection, having scientific interest mainly, will not be exposed to public view; while every effort will be made to have every mineral represented by all known varieties and from many localities, in order that whoever visits the Museum for mineralogical research may find the broadest opportunities. Full educational series will, however, be publicly displayed, together with all such specimens as are popularly attractive by consequence of their size or beauty. Very large specimens, of course, are shown on pedestals or in independent cases. At the date of writing, as nearly as may be estimated, the collection numbers 15,288 specimens, distributed as follows:—

On exhibition in the Museum	1,655
On exhibition in New Orleans	[*]500
Total	[*]2,155
In reserve series	5,881
Duplicates	5,883

The exact numbers cannot be absolutely given, for many of the specimens now on exhibition at New Orleans were received too late for full cataloguing and entry. As the work of installing the collection goes on, the distribution of specimens in the several series may be materially changed. In addition to cataloguing many minerals belonging to the old collection, accessions amounting to 3,145 specimens were entered upon the register during the year.

When I assumed the care of this department in December, 1883, the chemical laboratory of the Museum was also placed in my charge. In that laboratory I have conducted, with the aid of Messrs. T. M. Chatard, F. A. Gooch and Edward Whitfield, the chemical work of the U. S. Geological Survey, and whatever researches have been prosecuted upon the mineral material have been carried forward in that connection. Jointly with Dr. Chatard, I published a paper in the American Journal of Science for July, entitled "Mineralogical Notes from the Laboratory of the U. S. Geological Survey," which notes, together with many water, rock and ore analyses, have also appeared in Survey Bulletin No. 9. In these notes I have described a number of interesting minerals from various new localities, partly representing Museum material and partly the field collections of the Survey. The most notable item in the series, perhaps, is the account of pectolite from Alaska, which so closely simulates jade as to have been mistaken for the latter mineral. The laboratory is now reorganized in the northeast pavilion, where, with eight associates and laborers, I supervise the chemical and physical work of the Survey.

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[*] Approximate.

In conclusion I must express my indebtedness to my colleague, Mr. W. S. Yeates, upon whom has fallen most of the severer labor of arranging and classifying the mineral collection. Ensigns O. G. Dodge, Ernest Wilkinson and H. S. Knapp, of the U. S. Navy, have also rendered valuable assistance, and so, too, has Mr. J. H. Brown. Each of these gentlemen deserves much greater credit than can be fairly given in these necessarily brief lines.

XV.—DEPARTMENT OF LITHOLOGY AND PHYSICAL GEOLOGY.

By GEORGE P. MERRILL, *Acting Curator.*

The total number of entries upon the department catalogue during the year has been 2,541, comprising not less than 3,000 specimens of various kinds. The more important of these accessions are given in the following list:

Abbott, E. L. 10 specimens fulgurites from Union Grove, Ill.

Abert Collection. 24 specimens rocks from various sources.

Ackermann, A. A., U. S. N. 117 specimens rocks from Greenland.

Alexander, W. D. Sample of "barking sand" from Hawaiian Islands.

American Institute of Mining Engineers. 1 large geological map of Sweden and 84 specimens rocks.

Army Medical Museum. 8 specimens rocks.

Batchen, J. S. F. 103 specimens building stone from various States, and 5 specimens rocks.

Bartlett, Commander J. R. Specimens pumice and volcanic ash from Krakatoa.

Berendt, Dr. G. Samples of "barking sand" from sea-shore near Colberg, Germany.

Beauchamp, W. M. 1 concretion.

Bissel, John G. Supposed meteoric dust from near Rome, N. Y.

Bowker, Torrey & Co., Boston. 6 specimens Egyptian onyx; 1 specimen Griotte marble.

Boston Foreign Exposition. 1-foot cube of building stone (limestone) from the Hawaiian Islands, and 1 specimen building stone and 12 specimens rocks from Guatemala.

Brady, Gilbert. 1 dressed cube building stone (sandstone) from Albion, N. Y.

Branford, J. C. 3 sun-baked bricks from the Great Wall of China.

Burlington Manufacturing Company. 1 specimen ophite marble.

Calera Lime Works. 1 specimen building stone (limestone).

Centennial Commissioners 1876. 8 specimens building stone from the Azores Islands, and 15 specimens rocks from the Argentine Republic.

Centennial Commissioners 1876 (*Carl Petterson*). 14 specimens rocks from Norway.

Chandler, T. P., jr. 4 photographs and heliotypes of stone buildings.

Chatard, T. M. 100 pounds dunite from Corundum Hill, Macon County, North Carolina; also 3 specimens garnet rock from Macon County, North Carolina.

Clarke, Prof. F. W. Concretions, and 2 specimens glaciated muscovite and lepidolite.

Collard, E. 1 specimen rock grooved by glacial action, France.

Corson, R. R. 34 stalactites and stalagmites from Luray Caves, Virginia.

Crosby, Prof. W. O. 13 specimens rocks, in exchange for other material.

Diller, J. S. 150 specimens, andesites from Mount Shasta, California.

Dimond, John. 1 specimen California onyx.

Esperanza Marble Company (through George F. Breed, agent). 5 cubes and 1 large slab colored marbles from Vermont.

Evans, R. 2 specimens rock from Virginia.

Fontaine, Prof. William M. 3 specimens unakite and 2 specimens diabase from Madison County, Virginia.

Foster, J. E. & N. A. 1 specimen of rock.

Goode, G. Brown. 14 stalactites from Bermuda.

Gouldsburg & Son, New York. 1 specimen Tennessee marble.

Gouverneur Marble Company (through W. S. Yeates). 1 large block of marble with glacial markings.

Griffin, Miss M. E. Specimens of mica from Amelia County, Virginia.

Griffin, L. J. 1 specimen stalagmite marble from near Berryvale, Cal.

Grampner, R. F. 1 specimen of slate from Kansas.

Hall, C. J. 1 specimen building stone (red hornblende granite) from Mount Desert, Me.

Hall, Charles E., & Co. 3 specimens California onyx.

Hatch, J. C. 3 specimens albite from Auburn, Me.

Hawaiian Government. 13 specimens rocks.

Hawes, Dr. George W. (estate of). 693 specimens foreign and native rocks.

Holden, George H. 1 specimen zinc ore and 11 specimens serpentine from Deer Isle, Maine.

Hoosier Stone Company. 1 specimen building stone (oolitic limestone) from Bedford, Ind.

Hopkinson, J. Hemlock board driven by a hurricane through a white-oak tree 5 inches in diameter from Wesson, Miss.

Horn, Dr. G. H. 3 stalactites.

Houghton, F. W. Specimens pumice and volcanic ash from Krakatoa.

Jackson, Charles. 1 specimen of kaolin from Rockingham County Virginia.

Jansen, D. C. Fossil-bearing limestones from China.

Jones, Conner & Co. 1 small specimen of lithographic limestone.

Kempton, C. W. 1 specimen serpentine from Newbury, Mass.

Knapp, E. B. 10 specimens rocks from Skaneateles, N. Y., in exchange.

Landgraff, Herr. Pumice sand from Norway.

Leslie & Corse. 1 specimen of building stone.

Marshall, Lieut. W. A., U. S. N. Volcanic ashes from the Indian Ocean (Krakatoa).

McBride, Prof. T. H. 3 specimens fossil coral from Iowa.

McDonald, Col. M. M. 2 specimens marble from Virginia.

McKinley, C. M. 2 specimens rocks.

McLean, John J. 1 specimen pumice and of rock showing work of boring mollusks, from Cape Mendocino, California.

Merrill, W. J. 6 specimens limonite from Katahdin Iron Works, Maine.

Merrill, George. P. 1,000 pounds rocks of various kinds from New Jersey, Massachusetts, and Maine.

Mitchell, J. E. 13 specimens grindstones in the form of a column.

Mooney, B. 1 cube of dolomite 4 by 4 by 4 inches; a portion of the capstone of the Washington Monument.

Muzzey, A. P. 1 specimen diabase from Star Prairie, Mich.

Norris, W. P. 1 large geyser cone from the Yellowstone National Park.

North Carolina, State of (through W. S. Yeates). Collection of building stones and rocks.

Purchased. 707 specimens rocks and minerals from various sources.

Parker, H. W. 1 large slab of Triassic sandstone, with fossil foot-prints, from Saint Vrain Creek, Colorado.

Perry, N. H. 1 specimen small trap dike in granite.

Pendleton, P. 1 specimen building stone (sandstone) from West Virginia.

Pirz, Arnold. 2 large stalagmites, Carniola, Austria.

Powell, R. J. 1 specimen building stone and one diamond-drill core.

Pratt, W. S. 20 specimens flint from England.

Proctor, J. R. 70 specimens building stones from Kentucky.

Robinson, J. B. 1 specimen building stone.

Robinson, Prof. T. 30 bags soil and rocks from East shaft, water-works extension, Washington, D. C.

Royal University of Norway. 7 specimens rocks from Sweden.

Rusby, H. H. Calcareous incrustations.

Seeva, George. 10 specimens rocks showing the work of boring mollusks, Santa Barbara, Cal.

Shepard, James. Photograph of a bowlder at East Lyme, Conn.

Shriver, Howard. Collection of rocks.

Silver, A. L. 2 stalactites; 1 specimen of rock.

Smith, I. C., Washington, D. C. 1 phosphatic concretion (calculus) from the District of Columbia.

Smith, Frank S. 1 specimen of building stone.

Stonaker, C. L. 1 specimen rock from California.

Stoney, Lieut. George. M., U. S. N. Collection of rocks and volcanic ashes from the new volcano on Bogosloff Island.

Stearns, Silas. 2 fulgurites from Santa Rosa Island, Florida.

Tilghman, Messrs. B. C. & R. A., Philadelphia, Pa. 400 pounds assorted sizes chilled iron globules for stone sawing and grinding.

True, F. W. 1 specimen jade from New Zealand.

Turner, E. Y. Specimens beryl from Edgecomb, Me.

Townsend, C. H. 1 specimen stalagmite marble from Baird, Cal.

Tweedale, W. 2 specimens building stone.

U. S. Geological Survey (Messrs. Gilbert and Russell). 400 specimens rocks and tufas from Western States and Territories.

U. S. Geological Survey (Prof. Lester F. Ward). 26 specimens rocks and fossil woods from Montana.

U. S. Geological Survey (Cooper Curtice). 1 specimen rock.

U. S. Geological Survey (L. C. Johnson). 12 specimens rocks and building stones.

U. S. Signal Service. 11 specimens rock from Alaska.

U. S. Light-House Board. Plate of window-glass abraded by sand.

U. S. Geological Survey (S. F. Emmons). 16 specimens rocks from Colorado.

U. S. Geological Survey (W J McGee). 4 specimens silicified wood from the District of Columbia.

U. S. Fish Commission. 1 specimen of building stone from Wood's Holl, Mass.

Watts, J. J. Calcareous incrustations from Arizona.

Wharton, J. 1 specimen of pumice from Krakatoa.

Wheeler, Lieut. George M. 1 specimen rock.

Williams, Dr. George H. 10 specimens foreign rocks, in exchange for other material.

Williams, Dr. George H. 6 specimens rocks from near Baltimore.

Woesffel, C. F. 1 paper-weight composed of varieties of ornamental stones from Russia.

Of the list above given there are several worthy of a special notice. Prominent among these is the series of rocks and tufas from Utah, Nevada, and California received from Mr. I. C. Russell, of the U. S. Geological Survey. The tufas and lavas are particularly interesting and unique for exhibition material, and form a most valuable addition to our exhibition series. The numerous specimens of volcanic ashes and pumice received from Messrs. Wharton, Houghton, Bartlett, and Marshall are also of great value, not merely from a lithologic standpoint, but as conveying some idea of the character of the material ejected from the volcano of Krakatoa and the immense distances to which it was carried by wind and ocean currents.

The fulgurites received from Messrs. Abbott and Stearns are of interest as showing the great heat imparted to the sand by the passage through it of an electric discharge. Both these gentlemen added very materially to the value of their collections by accompanying them with full and explicit notes regarding the locality and occurrence of the specimens found. The collection of rocks and volcanic sand from the new volcano of Bogosloff Island, received from Lieut. G. M. Stoney, is also of very great interest, as showing the character of the ejected material from this recent volcano. This collection will probably furnish material for a special report.

Two collections of lithological interest, and of importance from their furnishing material not only for the Museum collections but also for exchanges, have been received. The first is a fine collection of one hundred and fifty specimens of andesite and pumice from Mount Shasta, California, collected and donated by Mr. J. S. Diller, of the U. S. Geological Survey. The fact that Mr. Diller is himself at present engaged in the study of these rocks and their mode of occurrence, renders the collection especially valuable. The second collection is one of some hundred pounds of dunite from Macon County, North Carolina, the gift of T. M. Chatard, also of the Survey.

Of the collections of more strictly economic importance should be mentioned one of upwards of one hundred specimens of building stones from various sources, received from Mr. J. S. F. Batchen, of Chicago, Ill. Mr. Batchen, from his intimate knowledge of the subject, is enabled to obtain much material of this nature that would otherwise be inaccessible to the department, and particularly is this the case in regard to the Western States and Territories. A recent donation of Mr. Batchen's from Mexico is of peculiar interest, the rocks being rhyolites or rhyolitic tuffs, a class of material entirely unknown in the Eastern United States, and, with the exception of a very few instances, but little used at present for building purposes. The Esperanza Marble Company, through its agent, Mr. George F. Breed, has presented a fine series of dark marbles from the company's quarries in Vermont, and Mr. L. J. Griffin has presented, through Mr. J. S. Diller, a specimen of the beautiful green stalagmite marble from his quarries near Berryvale, California. To Mr. J. R. Procter, the director of the State survey, the Museum is indebted for a complete series, comprising seventy-seven specimens, of the building stones of Kentucky, a State which heretofore was but poorly represented in our collections. The beautiful specimen of Egyptian onyx marble received from Bowker, Torrey & Co., of Boston, as well as the Californian marbles of like character from Messrs. J. Dimond, New York, and Charles E. Hall & Co., of Boston, make an important addition to our exhibition series, and ought to be noticed here also. Prof. Thomas Robinson, of Howard University, has rendered the department great service by collecting a full series of samples of the various strata passed through in the digging of the East shaft of the water-works extension in this city. In addition to the collecting of the samples, Professor Robinson also made full notes on the position and character of the strata, which will be of great use in preparing the collection for exhibition.

The collections of the department, as at present arranged, are broadly generalized under the heads of lithology—including the building and ornamental stones—and physical geology.

Lithological collection.—The lithological collection proper comprises all varieties of rocks of scientific or educational value, without regard to their economic importance. Rocks belonging to this series are, for convenience sake both in handling and storing, broken into blocks about 4 by 3 by 1 inches, with the edges carefully trimmed and the faces showing fresh fractures, with no abrasion marks from the hammer. The catalogue number is then painted on each, and they are stored in the drawers of the table-cases for purpose of reference and study, or placed upon exhibition, as the case may be. Each specimen thus prepared is accompanied with a written or printed label giving what information is known in regard to the same or referring to sources from which other information can be obtained. In arranging the rocks of this series, either for exhibition or for reference and study, collections illustrating the formations of any definite area, or investigations tending toward the solution of any particular problem, are preserved intact, while miscellaneous collections are broken up, classified by kind, and distributed throughout the general collections of the department.

The exhibition series of this collection comprises now some 800 specimens, but this number can easily be doubled as soon as proper cases are prepared. As a supplement to this collection, to explain their structure and mineral composition, a series of enlarged photomicrographs of twelve thin sections of typical rocks have been prepared. These enlargements are in the form of transparencies, 12 inches in diameter, and are colored by hand, the artist taking his tints from an examination of the sections themselves under the microscope and in polarized light. The illustrations thus prepared are very accurate as well as attractive, and cannot fail to add greatly to the value of the educational series of this department.

With particular reference to educational purposes, two special collections have been prepared during the past season; one a structural series of rocks, and the other a series of rock-forming minerals. The structural series is designed to show all the more typical forms of rock structure and texture; in other words, to illustrate by means of specimens the meanings of certain words and phrases in constant use in lithological nomenclature, but whose exact significance or force is poorly comprehended by the public in general. In this collection the rocks are divided primarily into three groups: (*a*) crystalline, (*b*), vitreous, or glassy, and (*c*) clastic, or fragmental, under which are arranged all those forms of structure common to each. The collection thus includes three nearly parallel series, and comprises, as at present arranged, forty-one specimens, each of which is accompanied by a printed label stating to which of the three principal groups it belongs, what type of structure it represents, and also the name of the rock specimen itself, the locality from whence it came, and the name of the donor or collector.

In preparing the collection of rock-forming minerals, rocks have been regarded as simply mineral aggregates of more or less complexity of structure and composition. The collection, therefore, includes representative specimens of all those minerals which commonly form an appreciable part of large rock masses, the rarer minerals and the gems being excluded. Each mineral species is shown in its several varieties, and is accompanied by a printed label giving its crystalline system, chemical composition, and the species of rock or rocks in which it commonly occurs. If the mineral itself possesses any economic value, this is also stated. This collection at present comprises 150 specimens, representing in their different varieties 46 mineral species.

The building-stone collection comprises only such material as is used in the rough or finished state for some form of building or ornamental work. All the stones of this collection are designed for exhibition, and for this purpose are cut into 4-inch cubes and finished in the following manner: Polished or fine-sanded in front; drafted and pointed on the left side; drafted rock face upon the right side; rock face behind, and smooth sanded or chiseled upon the top and bottom. Each block, when finished, has its catalogue number painted upon it, and is put on exhibition, accompanied by a printed label giving the scientific name of the stone, its geological age, color, texture, &c., together with the location from which it was taken, the names of the quarry-owners or lessees, and that of the donor or collector; the purpose being to so arrange and label the entire collection that all interested can, within the space of a few hours, see and examine for themselves all the varieties of building stone quarried in the United States, together with very many from foreign localities.

As a supplement to the building-stone collection, to illustrate the adaptability of certain kinds of stone to architectural purposes, a series of photographic negatives of some of the more important stone buildings of the country has been obtained, from which enlarged prints (30 by 40 inches) have been prepared. These prints have been painted in a manner to represent the natural color of the stone of which the buildings are constructed. The series comprises ten photographs of buildings constructed of the following materials: One each of granite, gneiss, limestone, marble, and serpentine, and five of sandstone, or sandstone in connection with brick.

Physical geology.—The collections of the department that may be appropriately grouped under the head of physical geology, that is, as of greater interest from bearing the marks of physical agencies than from their lithological characters, are at present comparatively limited. The more important of these are the collection of lavas from Ice Springs

Butte, Utah, to which reference has already been made; two specimens of glacial polished mica, received from Prof. F. W. Clarke; one large block glacial polished marble, gift of the Gouverneur Marble Company; a plate of sand-eroded glass, of especial interest as showing the remarkable eroding power of sand when blown by the wind, and sundry slabs of sandstone with ripple-marks and sun-cracks upon their surfaces. There is also an interesting series of models, which may be referred to here, including the Grand Cañon of the Colorado; the Yellowstone National Park; the Elk Mountains, Colorado; the Gulf of Mexico; the Grand Banks of Newfoundland, and Mount Vesuvius, Italy. Owing to the large size of the material that would be requisite for a display, phenomena of this class must necessarily be shown to a great extent by photographs, or illustrations of some sort, and models.

Routine work of the year.—Since the middle of July my entire time has been devoted to the preparation of exhibits for the New Orleans Exposition. To aid in this work a force of three stone-cutters, one stone-polisher, one laborer, and two clerks was employed for periods varying from six weeks to six months. During this time there were prepared and shipped to New Orleans the following collections: A type collection of the building and ornamental stones of the United States, comprising 358 specimens; an educational series of rocks in the form of hand specimens, 3 by 4 by 1 inches, comprising 500 specimens; and the structural series of rocks and collection of rock-forming minerals already referred to. There was also obtained for this purpose, from the U. S. Geological Survey, a series of 198 specimens of rocks illustrating the geology of the Comstock Lode and Washoe district, Nevada.

Other work of the year which may be mentioned here was the preparation of 1,557 labels for the exhibition series and 1,174 cards for the card catalogue. There have also been prepared some 200 thin sections of rocks, making the entire number of these now in the collection some 3,200. Prior to May 31 I was assisted in this and other clerical work by Mr. John H. Fillmore, U. S. N., and since July 11 by Mr. L. H. Merrill.

Owing to the pressure of the routine work of the Museum and the preparation for the New Orleans Exposition but little time could be given to original work or investigations with a view to publication. But two, and these very brief, papers have been prepared by myself. These are "On Prochlorite from the District of Columbia" (Proc. U. S. N. M., 1884, p. 67), and "On Hornblende Andesites from the new Bogosloff Volcano" (Science, December 12, 1884, p. 524). No papers have been published on material belonging to the department by parties not connected with the Museum.

Present condition of the collections.—The present condition of the collection may be briefly stated as follows: The total number of specimens in the reserve series is not less than 15,000, of which some 3,000 are now on exhibition (this includes the collections sent to New Orleans);

4,246 of these 15,000 are building or ornamental stones, of which 1,658 are now on exhibition; 600 more are dressed and can be placed on exhibition as soon as space and cases are provided. The number of specimens in the duplicate series cannot be accurately estimated, but will probably not vary far from 3,000, making a total of 18,000 specimens for the whole collection.

The following list gives the collection of building and ornamental stones in detail, the majority of the specimens being of sufficient size to dress into 4-inch cubes, or at least to give a finished surface 4 inches square:

UNITED STATES.	
Alabama	12
Arkansas	9
Arizona	6
California	46
Colorado	65
Connecticut	109
Dakota	5
Delaware	5
District of Columbia	3
Florida	15
Georgia	7
Idaho	2
Illinois	111
Indiana	99
Iowa	195
Kansas	192
Kentucky	93
Maine	127
Massachusetts	226
Maryland	109
Michigan	30
Minnesota	108
Missouri	158
Montana	9
Nebraska	8
New Hampshire	106
New Jersey	133
New Mexico	17
New York	274
Nevada	8
North Carolina	125
Ohio	314
Oregon	6
Pennsylvania	331
Rhode Island	42
Tennessee	127
Texas	48
Utah	13
Vermont	220
Virginia	72
West Virginia	17
Washington Territory	4
Wisconsin	89
Wyoming	6
FOREIGN COUNTRIES.	
Bermuda	15
Canada	17
China	1
Egypt	10
France	4
Germany	4
Greece	2
Ireland	1
Italy	89
Japan	50
Mexico	16
New Brunswick	5
New South Wales	20
Portugal	154
Russia	21
Scotland	24
Turkey	2
Total	4,246

Of the collections now on exhibition the following may be noted as of especial interest:

Fourteen hundred specimens of building and ornamental stones of the United States. These are nearly all in the form of 4-inch cubes, prepared as already described. A part are, however, in foot cubes, and a few others of still larger size.

One hundred and twenty-six specimens building and ornamental stones of Portugal and the Azores Islands, mostly in the form of 4 and 8-inch cubes.

Thirty-three large cubes of Italian marbles, a beautiful and very complete collection, made under the direction of Hon. William T. Rice, U. S. consul at Leghorn, Italy. Also a similar collection of 45 specimens in the form of slabs 4 inches square by one-half inch thick, the gift of W. W. Story.

A collection of 30 specimens of marbles and serpentines of Japan. Gift of the Japanese Centennial commissioners.

A series of 19 blocks of marble, each 1 foot square, illustrating the different styles of finish usually applied to these stones. Gift of the Vermont Marble Company.

A similar collection of 8 blocks of sandstone. Gift of the McDermot and Berea Sandstone Company

A similar collection of 8 blocks of Quincy granite, the gift of H. Barker & Sons.

One large slab (20 by 34 inches) of Potomac breccia marble. Gift of Col. Edward Clark.

One large slab (40 by 56 inches) of quartzite from Luserna, Italy. Gift of the Italian Centennial commissioners.

A series of upwards of 100 specimens of siliceous and calcareous sinters from the Yellowstone National Park. Collected by Dr. A. C. Peale.

A series of 90 specimens lava from Ice Springs Butte, Utah. Received from I. C. Russell, U. S. Geological Survey.

A series of 25 specimens tufas from Lake Lahontan and Pyramid Lake, Nevada. Received from I. C. Russell, U. S. Geological Survey.

A series of 7 large specimens obsidian and obsidian pumice from the Mono Craters, California. Received from I. C. Russell, U. S. Geological Survey.

A series of 152 hand specimens rocks of Yellowstone National Park. Gift of W. H. Holmes.

A series of 92 specimens rock of Saxony. Received from the Royal Mining School of Freiburg, Saxony.

A series of 12 specimens "onyx" marbles from various localities, including Californa, Mexico, and Egypt.

A collection of 70 specimens of stalactites and stalagmites from the Luray Caves, Virginia, Carniola, Austria, and other localities. This collection is particularly interesting on account of the size and beauty of the specimens. The department is indebted to Mr. Robert Corson for the magnificent series of specimens from Luray.

A series of 150 concretions of various kinds and from many sources. Of especial interest in this collection are four large specimens, the largest 2 feet in diameter, from Cannon Ball River, Dakota, the gift of General M. C. Meigs.

A series of 84 hand specimens of rocks and a geological map of Sweden. Gift of Swedish Centennial commissioners and American Institute of Mining Engineers.

One large slab (7 feet 5 inches by 3 feet 8 inches) of granite. Gift of New England Granite Company, Westerly, R. I.

One large slab (4 by 8 feet) of sandstone. Gift of Forest City Stone Company, Euclid, Ohio.

One large block (5 by 5 by 1 feet) of syenite from Hot Springs, Ark. Gift of J. S. F. Batchen.

Among the collections of the reserve series, but which are not now on exhibition, should be mentioned a series of 854 hand specimens of rocks from the various geological horizons of Canada, New Brunswick, and Nova Scotia, received from the Centennial Exhibition at Philadelphia, 1876; a series of 355 hand specimens illustrating the geology and lithology of Victoria, Australia; a series of 150 specimens illustrating the geology and lithology of New Hampshire, as described by Dr. George W. Hawes in the third volume of Geology of New Hampshire; and lastly the Rosenbusch collection, already noted. This collection comprises 587 specimens representing all the more important rocks which have been studied and described by Professor Rosenbusch, of Heidelberg. It is, therefore, of great value for reference purposes, and may be regarded as the most important accession of the year.

The history of the geological department of the Museum may be said to date from the appointment of Dr. George W. Hawes as curator, in 1880. Prior to this time the collections were small and very miscellaneous in their character, the only material of real value, from a geologic or lithologic standpoint which they were found to contain, being a collection of 300 specimens of rocks from France, received from Louis Saemann in 1869, and a similar collection of 148 specimens of rocks of Saxony, received from the Royal Mining School of Freiberg in 1863. There was, it is true, much material that might have been of value had there been any accurate data concerning it, but so poorly had the records been kept that in many cases absolutely nothing could be learned in regard to the collections, or if anything, the information was so meagre as to be useless.

At the time Dr. Hawes entered upon his duties as curator, he also took charge of that branch of the Tenth Census relating to the quarrying industry of the United States. To this work he gave almost his entire attention, and the present building-stone collection is the result of his exertions in this direction. Dr. Hawes's connection with the Museum was, however, too short to allow the department to become fully organized, and at the time of his death matters were, if possible, in a state of greater confusion than before, owing to the large amount of material that had accumulated, and the extent of the work undertaken but necessarily uncompleted. The great amount of material received from the Centennial Exhibition at Philadelphia in 1876 was still unassorted, as was also that received from the various United States

Geological Surveys that existed prior to the present organization. The records of a great deal of the latter material were in a deplorable condition, and the specimens themselves had in many cases been so abused as to be completely worthless.

To the Centennial Exhibition, the Tenth Census, and the various Geological Surveys the department is largely indebted for whatever material it possessed prior to 1882. The time since the reorganization of the department and its assignment to myself has been too short for anything more than a beginning to be made. What work has actually been accomplished has already been noted.

The imperative need of the department is a larger permanent working force. The confusion which was found to exist among the old collections is due entirely to the fact that sufficient time and care were not given to the preservation of the identity of the material. It is not enough that the curator knows, however thoroughly, the collection under his care, but the facts in regard to each and every specimen should be so placed on record that its identity can never again be lost, however often the administrative force of the department may be changed. There is probably no department of the Museum in which the value of material depends more upon its correct identification and localization. The most valuable material of the collection to-day may to-morrow become totally worthless from no other cause than an uncertainty arising as to the exact source from which it was obtained.

The very considerable amount of petrographical work being at the present time carried on in this country renders it extremely important that somewhere should be preserved a representative series of the more important rocks described, either the types themselves or exact duplicates of the same. The value of such a collection, both for present and future reference, cannot be overestimated, especially when we consider the prevailing unsatisfactory system of rock classification and nomenclature. While each worker, it is true, now makes collections for his own use, these are necessarily limited and so widely scattered as to be practically inaccessible to the majority of workers. A very small outlay yearly will allow the gathering together of representative specimens of the greater proportion of this material in the National Museum, where it will be accessible for reference and study to all responsible parties, and also be secure from destruction by fire or other agencies. The recent destruction of the entire collection of Professor Irving by the burning of the buildings of the university at Madison, Wis., is in itself sufficient argument in favor of such an undertaking.

XVI.—DEPARTMENT OF METALLURGY AND ECONOMIC GEOLOGY.

By FREDERIC P. DEWEY, *Curator.*

REPORT OF THE CURATOR.

During the first part of the year the still unorganized material received from Centennial sources occupied a great deal of attention. Besides this, there have been a great many accessions received that are worthy of special mention, and these may be divided into four classes: Those received in the ordinary way; those received from the Permanent Exhibition at Philadelphia; those received from the Boston Exhibition; and the material collected in connection with the New Orleans Exposition. The material received in the ordinary way embraces a very fine collection from the works of the Colorado Coal and Iron Company, at South Pueblo, Colo., representing very fully the process of manufacture of steel rails, nails, &c., at these works. This collection was made and presented by C. L. Stonaker, of South Pueblo, Colo.

A collection of the iron ores of California, and also a very valuable collection of copper and other ores from the Lake Superior region, presented by R. E. C. Stearns, U. S. National Museum. The latter collection is very valuable from a historical standpoint.

A collection representing the extraction of copper from Canadian pyrite after the sulphur has been utilized for the manufacture of sulphuric acid. Presented by the Orford Copper and Sulphur Company.

A small but valuable collection representing the work of the hydraulic process for the extraction of gold from gravel deposits from the Brewer mine, South Carolina. Presented by E. Motz.

A collection of about 600 specimens representing the process of manufacture of bolts, nuts, and washers by machinery, together with the various commercial sizes of these articles; also a very interesting collection representing the manufacture of bnsheled or refined iron from scrap material. Presented by J. H. Sternbergh, Reading, Pa.

By far the most interesting and valuable single collection received during the year is the extensive collection of iron ores collected by the Tenth Census, under the direction of Prof. R. Pumpelly. This collection represents the occurrence of iron ore at every mine of any importance that was worked during the census year. Carefully selected samples were also taken for analysis, and the powdered material for this purpose accompanies the hand specimens. The whole collection comprises over 3,600 specimens.

From the Permanent Exhibition at Philadelphia were received a very extensive and valuable series of tests of the mechanical properties of the Fagersta steel made by Kirkaldy, of London. This is by far the most complete series of tests of steel ever made, and the records in regard to the tests are full and complete, so that it is still a standard of reference.

A collection of the various ores of Colorado.

A collection representing the mineral resources along the line of the Little Rock and Fort Smith Railroad.

Two interesting collections representing the manufacture of horseshoes by machinery, giving the various styles and sizes adapted for different uses. One presented by the Burden Iron Company, Troy, N. Y., the other by the Rhode Island Horseshoe Company, Providence, R. I.

A large collection of the different sizes and kinds of tacks. This collection, while being very large, is not as systematic as we would like, but the works have agreed to supply the deficiences and also to illustrate the process of manufacture, and when the collection is completed it will form an interesting and attractive exhibit. Presented by the Pennsylvania Tack Works, Norristown, Pa.

A large collection of the various naturally occurring salts of Stassfurt, Germany.

From the Boston Exhibition were received collections representing the mineral resources of San Salvador, Guatemala, and Venezuela. Presented by the respective commissioners.

A collection of Ceylon graphite. Presented by Delmege, Reid & Co.

A very large and complete series of graphite crucibles. Presented by Gerbrüder Bessel, of Dresden.

In connection with the preparation for the New Orleans Exposition, the curator has collected in person from the following localities:

A series representing the refining of Arizona pig-copper as carried on at the works of the Ansonia Brass and Copper Works, Ansonia, Conn.

A series representing the smelting of argentiferous lead ores at the Horn Silver Works, Francklyn, Utah.

A series representing the chloridizing roasting of base silver ores at the Ontario Mill, Park City, Utah.

A very large collection representing the copper and silver industry at Butte, Mont. This collection embraces the copper and silver ores of the region; two collections representing the chloridizing roasting of the ores from the Lexington and Moulton mines; three collections representing the smelting of the argentiferous copper ores from the Montana, Bell, and Parrot Works; and a collection representing the smelting of auriferous and argentiferous copper ores from the Colorado Smelter.

The following collections were obtained, upon solicitation of the curator, for the New Orleans Exposition:

A collection representing the extraction of gold from the auriferous gravel of California by the hydraulic process. Collected by Mr. W. H. Radford.

A collection representing the extraction of gold from auriferous pyrite from the Bobtail Mill, Black Hawk, Colo. Collected by E. M. Rogers.

A collection representing the delicate manipulation required in the manufacture of gold leaf. Presented by Hastings & Co., of Philadelphia, Pa.

A very large and extensive collection of the ores of Utah. Presented in exchange by Prof. J. E. Clayton, Salt Lake City, Utah. This collection is especially valuable as filling in many gaps of our permanent collections, and also supplying some ores which are only found in Utah.

Collections representing some of the recently discovered tin ores of the country. From Virginia, presented by the Cash Mining Company; from Alabama, presented by Dr. George W. Gessner; and from Dakota, presented by Prof. George W. Maynard.

A collection representing the process of manufacture of white lead and other lead paints. Presented by Harrison Brothers & Co., of Philadelphia, Pa.

A very large and interesting collection representing the manufacture of copper into various commercial forms, the manufacture and utilization of brass, and the process of wire-drawing. Presented by the Ansonia Brass and Copper Works, Ansonia, Conn.

A collection representing the smelting and refining of copper from various sulphureted ores. Presented by Pope, Cole & Co., Baltimore, Md.

A collection representing the refining of native copper separated from the ores of the Mass Mine, Lake Superior. Presented by C. G. Hussey & Co., Pittsburgh, Pa.

A collection representing the smelting of pig-iron from fossiliferous ores at Rockwood, Tenn. Presented by the Roane Iron Company, Chattanooga, Tenn.

A collection representing the smelting of pig-iron from brown ores in Virginia. Presented by the Longdale Iron Company, Longdale, Va.

A collection representing the very interesting and intricate process of the manufacture of crucible steel. Presented by Miller, Metcalf & Parkin, Pittsburgh, Pa.

A very interesting collection representing various processes of iron and steel manufacture in Sweden, together with descriptions of the processes. Presented by N. Lilienberg, New York.

A large collection of the zinc ores from the Bertha mine. Presented by Thomas Jones, Pulaski, Va.

A collection of the Mossy Creek, Tennessee, zinc ores. Presented by T. H. Heald, Knoxville, Tenn.

A series of collections representing the mining of iron pyrite and the manufacture of sulphuric acid therefrom. The Virginia pyrite, presented by W. H. Adams; the Massachusetts pyrite, presented by the Davis Company, of Boston; and the manufacture of sulphuric acid, presented by the Merrimac Chemical Company, Boston, Mass.

A very large and interesting collection of Babbitts, solders, and other alloys, and also a series of the various grades of Welsh tin plates, together with descriptions of the manufacture. Presented by Merchant & Co., Philadelphia, Pa.

A very interesting collection representing the growth and present condition of the process for the manufacture of type metal. Presented by Mackellar, Smiths & Jordan, Philadelphia, Pa.

A full collection of Babbitt and similar alloys. Presented by Paul S. Reeves, Philadelphia, Pa.

A series of Ajax metal specimens for bearings, &c. Presented by the Ajax Company, Philadelphia, Pa.

A very interesting collection representing the manufacture of sand and emery paper. Presented by Baeder, Adamson & Co., Philadelphia, Pa.

A very large and complete collection representing the occurrence of asbestos from various countries and its manufacture into marketable forms. Presented by the H. W. Johns Company, New York.

A collection of various polishing materials. Presented by R. J. Waddell & Co., New York.

A collection of corundum, emery, and quartz of various sizes. Presented by the Union Stone Company, Boston, Mass.

A valuable collection of drawings representing the application of the Siemens regenerative principle to various kinds of furnaces. Presented by Richmond & Potts, Philadelphia, Pa.

A collection representing the application of the diamond drill in boring, especially for prospecting purposes. Presented by the Pennsylvania Diamond Drill Company, Pottsville, Pa.

A small but interesting collection of tin ores from Maine and North Carolina. Collected by Prof. F. W. Clarke, U. S. Geological Survey.

A complete series representing the Connellsville coking coal and its associates, together with coke of various grades. Presented by the H. C. Frick Coke Company, Pittsburgh, Pa.

Mr. James Temple Brown, of the Museum staff, made the following collections:

A complete series representing the manufacture of miners' boots. Presented by Humphrey Brothers & Tracy, Towanda, Pa.

A complete series of the domestic sizes of anthracite coal, together with its associates; also an extensive series of mining tools, &c. Presented by the Philadelphia and Reading Coal and Iron Company, Pottsville, Pa.

A series representing the coal and its associates from the Long Valley mines. Presented by the Barclay Coal Company, Barclay, Pa.

A series of coal and its associates, together with mining tools, from the Loyal Sock mine. Presented by the State Line and Sullivan Railroad Company.

Four photographs of anthracite breakers. Presented by George M. Bretz, Pottsville, Pa.

Three photographs of mine engines. Presented by Richard Sharpe, jr., & Co., Wilkes Barre, Pa.

A series of gas coal and its associates from the Crescent mines, West Virginia. Presented by W. R. Johnson, Crescent, W. Va.

A series of coal and its associates from the Antrim mines. Presented by the Fall Brook Coal Company, Corning, N. Y.

A series of coal and its associates, together with mining tools, from the Arnot mine. Presented by the Blossburgh Coal Company, Elmira, N. Y.

A series of safety lamps, &c. Presented by J. W. Queen & Co., Philadelphia, Pa.

Quite a number of the recent graduates of some of the technical schools were very glad to visit some of the centers of metallurgical operations to make collections for the department upon the payment of their expenses while so engaged. The collections acquired in this way are among the most interesting and valuable that we have obtained, since they were made with the definite purpose of exhibition in the Museum, and therefore are better suited for permanent purposes. Mr. E. B. Kirby, E. M., of Saint Louis, Mo., made collections representing the mining of the free copper ore of the amygdaloid class at the Osceola Mine, Lake Superior, and also the mining and milling of the conglomerate ore at the Delaware Mine, Lake Superior; a collection of showy zinc-ore specimens from Missouri; a collection representing the manufacture of pig-lead and white paint direct from the ore, from the Lone Elm Works, Joplin, Mo.; and a collection representing the mining of coal at Belleville, Ill. At Mr. Kirby's solicitation, Captain Daniels, of the Osceola mine, presented some interesting specimens representing the association of the free silver and free copper in the Lake Superior district, and Mr. J. A. Reeves, of Joplin, Mo., presented some very handsome crystallized specimens of blende, galena, and marcasite. Mr. E. L. Zukoski, E. M., of Saint Louis, Mo., collected at the Osceola Mill and Central Mine, Lake Superior; at the Kansas City Smelting and Refining Company's Works, Argentine, Kans.; at the Rich Hill Zinc Furnaces, Rich Hill, Mo.; at the Cherokee Zinc Works, Weir City, Kans.; at the Nova Scotia Furnace, Salem, Mo.; and at the Mount Olive and Collinsville coal regions, in Illinois. Messrs. Kirby and Zukoski together made a very large collection representing the manufacture of Bessemer steel and the rolling of steel rails at the South Chicago Rolling-Mill; also a collection representing the smelting of copper slags at the Native Copper Smelting Works, Lake Superior.

Mr. J. P. Gazzam, E. M., collected at the Cheltenham Smelting and Refining Works, near Saint Louis, Mo.; at the Glendale Zinc Works, also near Saint Louis; at the Joplin Zinc Works, Joplin, Mo.; at the Saint Genevieve Copper Works, Saint Genevieve, Mo.; at the Missouri Furnace and the furnaces of the Saint Louis Ore and Steel Company, near Saint Louis; at the mines and works of the Granby Mining and Smelting Company; at the South Side Mining and Manufacturing Works, Galena, Kans.; at the zinc works of Robert Lanyon, Pittsburgh, Kans.; at Mine La Motte, Missouri; at the zinc mines of Cowan & Bliss, Frye & De Graffe, and Moore, De Graffe & Co., Lehigh, Mo.

At Mr. Gazzam's solicitation, Page & Krause, of Saint Louis, Mo., presented a collection representing the manufacture of zinc paint, and also the manufacture of barytes. The Saint Louis Tripoli Company presented a collection representing the utilization of tripoli.

Messrs. Kirby and Gazzam made a very handsome collection of zinc ore from the mines of Spencer & McConey, Carterville, Mo., and Cowan & Bliss, Lehigh, Mo.

The department is under great obligation to Prof. W. B. Potter, of Washington University, Saint Louis, Mo., for advice and assistance in directing the work of these three young men.

Mr. J. B. McIntosh, E. M., of New York, collected at the Passaic Zinc Works, Jersey City, N. J.; at the Bellemont Forge and Crown Point Furnace, in Northern New York; and at the smelting works of E. Balbach & Son, Newark, N. J.

Mr. J. F. Kemp, E. M., of Brooklyn, collected at the Desloge and Saint Jo Lead Works, Joplin, Mo.

Mr. H. S. Fleming, of Philadelphia, collected at the Warwick and North Cornwall Iron Furnaces, in Pennsylvania.

Mr. D. W. Reckhart, of Salt Lake City, made some systematic collections from various mines in Utah.

Messrs. D. W. Reckhart and C. F. Pearis, E. M., collected at the Germania Smelting and Refining Works, near Salt Lake City, Utah.

There was acquired by purchase a series of 87 specimens representing the occurrence of placer gold at nearly all the prominent regions of the country. This collection is especially valuable from the fact that many of the specimens were collected in the early days, and the date of collection of nearly every one is known. It is the most full and complete collection of its kind in the country.

There was also purchased a series of drawings of furnaces, to be used for wall decorations.

Early in the year it was decided to administer upon the pile of boxes and the material which had been stored away in the pigeon-holes of the work-room of the department in the southwest court, with a view to clearing out the space and making it available for exhibition purposes. The force of workmen in the department being considerably increased, this work was undertaken with as much vigor as possible and continued until the middle of June. It was found that much of this material had never been entered in the catalogue, and it was necessary, therefore, to make 4,182 new entries, embracing 7,540 new specimens. Of these the most important collections were the steel exhibits of Park Brothers & Co., Hussey, Wells & Co., and Carnegie Brothers, Pittsburgh, Pa.; a collection of rolled iron shapes from the Phœnix Iron Company; a very large collection of fire-brick from many localities; a collection of ores from Colorado; and two collections representing the smelting of copper, one from Ducktown, Tenn., and the other from Phœnixville, Pa.

The entire collection of foreign ores was overhauled and put into shape for exhibition. This collection embraces a very valuable series from the Krupp Works, Essen, Germany; collections representing the ores of Sweden, Russia, Spain (very large and complete), Portugal, Italy, Turkey, Japan, Mexico, and the Australasian colonies. This latter collection is especially valuable on account of its richness in specimens of tin ores and their associates.

The entire collection of coals belonging to the department was examined, and it was found that many specimens had seriously decomposed, and were therefore of little value. Such as were yet in good condition, and from localities difficult of access, were saved and put upon exhibition. By the middle of April a section of this work-room had been so far cleared that it was thrown open for exhibition purposes, and the work was continued until the material for the New Orleans Exposition began to arrive, when it was necessarily suspended.

At the opening of the year very little progress had been made in the regular installation of the collection, although many specimens were available. In connection with the work of clearing out the work-room, the installing of the specimens was taken up, and an attempt made at temporary arrangement. This has so far proceeded that the very valuable collection of native ores is now installed in the large black-walnut cases. A portion of the Census iron ores has also been installed, and the steel exhibit of Park Brothers & Co., the rolled shapes from the Phœnix Works, portions of the Kirkaldy test specimens, and a portion of the tack exhibit have been placed on exhibition.

A large amount of the foreign material has been displayed, but it has not yet been systematically arranged and installed.

Nineteen letters of information and report upon specimens submitted have been made, together with nine other reports. In the preparation of the catalogue of the collection 10,960 entries have been made, covering 15,271 specimens; and in the preparation of the card catalogue 9,337 cards, covering 12,363 specimens, upon which 389 determinations of mineral species have been made, have been written.

Work in the line of research has been confined to such examinations of the material to be exhibited at New Orleans as were necessary for the preparation of suitable descriptions and labels of the exhibits in this department, and has necessarily been very much broken. The plan followed was to do only the necessary work of preparing the material for the temporary exhibit at New Orleans, and to confine such work to that which would be suitable for use in the final examination of the material, which must be delayed until its return from New Orleans.

In this connection Mr. J. A. Allen has made, in the laboratory of this department, seventeen quantitative analyses since the 1st of July, besides a great many qualitative examinations.

The material collected for the New Orleans Exposition offers many promising topics for research, and this work will be taken up and carried forward as rapidly as possible upon the return of the material to Washington.

The only papers published by the curator were, chapter III in the Tenth Census Report of the Building Stone Industry, entitled "The Chemical Examination of Building Stones," and a biographical memoir of the late Dr. George W. Hawes. These are noticed in the bibliographical appendix to this report.

The large amount of work that has been put upon the material of this department during the past year has brought it under very much better control. It has now been so far examined and administered upon that it is much easier to tell what we have and what we have not than it has been at any former time. In the reserve series have been placed 1,345 specimens, besides which there is yet included in this series a considerable amount of material not yet administered upon. Nine thousand five hundred specimens have been placed on exhibition and 1,353 specimens assigned to the duplicate series. Fifty-nine boxes have been placed on general storage, containing duplicate materal the records of which are imperfect. The total number of specimens in the department is not far from 40,000.

The collections in economic geology in the department have now been thoroughly organized, and while we have known for a long time that the representations of the mineral resources of the country were very full and complete, yet much material, until this year, has been stored away, and more or less inaccessible. Of the localities which had been developed previous to the Centennial Exhibition the illustrations are exceedingly full and complete; in fact, no single collection of the kind can be found to compare with it anywhere else. There are, however, many localities which have come into prominence since the close of the Centennial, and these were only partially or not at all represented in the Centennial material. From time to time some of these deficiences have been supplied, but there are yet quite a number of localities not represented, the most important of these being the Menominee iron region, in Michigan, and the Territories of Arizona and New Mexico. Steps have been taken, in connection with the New Orleans work, to gather material from some of these localities, but so far nothing has been received, although I am very hopeful that something may be accomplished by the requests we have already made.

As pointed out in my former annual reports, the representations of metallurgical processes have been the weakest portion of the collections. This is a matter requiring the collection of systematic series, in which the various specimens are interdependent. The collections would not necessarily be at all showy, and it is therefore not so surprising that the Centennial material should have been deficient in this respect. Fortunately, however, the necessity of collecting new material for the New Orleans Exposition has furnished the much-desired opportunity of strengthening the collections in this direction. It is not easy to get collections of the kind required. In the first place, only a very few owners of mines or works will take the necessary trouble to get full and complete series, and when they do so they frequently do not wish to give the necessary information in order that the specimens shall possess the highest value in an educational series. This reluctance to give information has been the most serious obstacle the department has met with in its collecting. The design of the collecting has been to commence first with the ore and take series of specimens in the mine taken at various points, which shall be referred to some central starting point, so that the position may be known and traced up afterwards if desirable. These specimens are taken to show the various characters of ore produced by a given mine. Again, series of specimens are taken to represent the changes that the ore undergoes in going up and down the mine, and also in going through it both lengthwise and crosswise. The inclosing wall rocks are also thoroughly represented.

In connection with this collection as much information as possible has been obtained as to the methods of mining and the habits of the miners.

After the ore is extracted from the mine it is followed through any process of concentration that it may be subjected to, such as the crushing and jigging of the sulphide of copper ores in Montana, the washing of iron ores, or any other operation in preparation for smelting. Each step in these operations is represented, when possible, by specimens of the material that forms the basis of the operation, and by the products, whether they be the valuable ones or the waste products. To the material as prepared for smelting are added illustrations of all other materials entering into the smelting operation, such as fuels and fluxes. Each step in the smelting operation is illustrated by the different materials entering into the operation and by their products. This is followed through as far as a given mine or works go, and if possible the material is followed on through other works until it reaches its merchantable form. These collections are accompanied and supplemented by all the information it is possible to get in the way of statistics, plans, drawings, and views of the mines and works. Aside from the value of such systematic collections in metallurgy, they open up a wide field for research in the laboratory, and will therefore form the basis for future work in that direction. The complete examination of the material already received will add largely to the stock of information in regard to the science of metallurgy. Metallurgy being essentially an economic science, most of the writings on the subject have been confined to the one question of carrying on the operations at a profit, leaving the consideration of the whys and wherefores and the scientific principles involved almost entirely out of the question. This lack of information in regard to the science of metallurgy is very unfortunate, and it is the desire of the curator to so arrange the proper work of the department, in preparing material for exhibition, as to add as much as possible to the stock of scientific information.

The collections sent to the New Orleans Exposition could not possibly be made to cover the whole ground. In fact, the work is mainly preliminary, but it is hoped that the results obtained will be of sufficient value to warrant an extension of the number of such illustrations, so that some system of collecting material of this kind will be inaugurated which will add largely to the material on hand, and in time build up the collections in metallurgy so that they will compare favorably with those at present in the Museum in the line of economic geology.

The principal drawbacks to the collecting for New Orleans were the shortness of time and the small amount of money available for the work. Most of the systematic collections were made either by the curator in person or else by the young men already referred to—recent graduates of technical schools—who were very willing to give their time to the work in consideration of the benefit it would be to them to visit mines and metallurgical works under the auspices of the Smithsonian Institution, in order to increase their stock of information, the only cost to the Museum being their actual expenses while making the collections.

In order to illustrate more fully the scope and design of these collections it seems desirable to describe briefly the collections as made, with special reference to the material already in the Museum and also to what it would be desirable to collect in the future.

Gold.—Gold being a metal of so much intrinsic value, the collections already in the Museum were not at all complete, and it is the only instance in which it was thought desirable to make any separate attempt to collect the ores. In this connection a series of 87 specimens was purchased, representing the occurrence of placer gold in Virginia, North Carolina, South Carolina, Georgia, Colorado, New Mexico, Idaho, Montana, Utah, Oregon, California, and Alaska. Some of these specimens were collected as long ago as 1848, and in some cases are the first discovered in the region. In the case of California there is a specimen containing some of the first gold-dust taken out by Captain Marshall on the 19th of January, 1848. The fact that these specimens were collected so long ago, and that the date of collection is known in almost every case, adds very greatly to their value. Indeed, it would be absolutely impossible to duplicate many of the specimens.

A very interesting series of specimens was obtained from the Brewer Mine, South Carolina, in which the principles of hydraulic mining as carried on in California are applied.

In the extraction of gold only a few processes have been illustrated.

A very fine collection was obtained from the North Bloomfield Mine, Nevada County, California, representing the average of the rock as it is washed down by the little giant, the mercury used to catch the gold in the riffles, the amalgam as it is collected in the riffle-boxes, the purified amalgam, the gold produced from retorting the amalgam, fine gold, and coarse nuggets of gold that are picked up off the floor of the mine at the clean-up. To this series is added a collection showing the heavy minerals associated with the gold which are taken out from the riffle-boxes with the amalgam. This is an exceedingly interesting and valuable collection, illustrating as it does not only the extraction of gold, but also as illustrating a process which is without doubt the most economical of any mining process carried on anywhere, the actual cost of moving a ton of material from the mine, collecting and saving the gold, and discharging the waste material being but a few cents.

The next collection illustrates the extraction of free gold from auriferous pyrite by stamping the material and collecting the gold, as an amalgam on copper plates, as carried on at the Bobtail Mill, Black Hawk, Gilpin County, Colorado. This collection shows the ore as received at the mill, which consists of a mixture of iron and copper pyrite disseminated through quartz and clay (the gold occurs in the pyrite); the crushed material as it is passed through the sieves of the stamps; the battery pulp; the gold amalgam as scraped from the copper plates; the gold resulting from the retorting of the amalgam; the concentrations obtained by allowing the heavy portion of the material to settle out in running water, consisting of pyrite and calcopyrite and containing a very considerable amount of gold; and the sand or waste material. It is the only illustration of extracting gold by stamping and amalgamating that we have, and in the future development of the plan it would be desirable to add two or more series, illustrating the treatment of different characters of ore.

In the smelting of auriferous material a collection was made at the Colorado Smelter, at Butte, Mont., by the curator. This represents the various ores available to this smelter, the fuel and fluxes used, the matte produced, and the slag. The work at this smelter is only the first step in the process. The matte, which contains about 50 per cent. of copper, together with the gold and silver of the ores, is shipped to the Argo Works, near Denver, for further treatment.

A small but interesting collection was obtained from the works of E. Balbach & Son, Newark, N. J., representing a combination of the smelting process with the electrolytic process for the separation of gold from copper. It contains various ores, together with the fuels and fluxes, several mattes, the residue containing the gold from the electrolytic deposition of the copper, a very handsome sheet of the electrolytic copper, and a small bar of the gold separated from the residues.

To these collections representing the extraction of gold is added a single illustration of its utilization.

A collection showing the exceedingly minute and delicate manipulation required in the manufacture of gold leaf. This collection starts with a sheet of gold as thin as it is convenient to produce by passing it through rolls; then the various steps in the process of reducing its thickness by beating it with hammers between skins until the exceedingly thin gold leaf of commerce is produced. This collection is presented by Hastings & Co., Philadelphia.

It is very desirable to illustrate other processes of the utilization of gold, and one of the first collections that we ought to have, and one that it would not be very difficult to obtain, is an illustration of the manufacture of gold coins.

Iridium.—A small amount of the iridosmine, found on the northern shores of California, shows the different sizes of grains of the material as obtained. To this is added a small amount of the material as separated from placer gold at the mint in purifying it for the manufacture of gold coins.

Silver.—A very large collection of the silver ores of Utah was obtained. Part of the material was donated in exchange by Prof. J. E. Clayton, of Salt Lake City, Utah, and was material that he had collected from time to time, much of it such as could only be occasionally obtained by a collector on the ground. The rest of the collection consists of new material obtained at various mines near Salt Lake City by Mr. Reckhart.

Some very handsome specimens showing the association of native silver with native copper from the Lake Superior region mines were presented by Capt. John Daniels, of the Osceola Mine.

A good set of specimens showing the native silver with sulphide of copper was obtained by the curator at Butte, Mont.

There are a few localities producing beautiful specimens of native silver that are not at present well represented in the Museum, and it would be very desirable to strengthen the collections in this direction by some further collecting, especially in the southwestern portion of the country, which is not as thoroughly represented in the ore collection generally as it ought to be.

The extraction of silver from its ores is represented by a large series of collections, but more difficulty was encountered in getting full collections, with the necessary information, in the case of silver than with that of any other metal. No illustrations of the process of extracting silver directly from its ores by stamping and amalgamating were obtained. This is a process that is of somewhat limited application and yet one of considerable importance, so that a collection illustrating it would be very desirable.

The treatment of base ores, that is, ores carrying lead and silver, by roasting with salt (chloridizing) and stamping and amalgamating, is illustrated by three collections made by the curator. The first collection is from the Ontario Mill, Park City, Summit County, Utah, which works the ore from the Ontario Mine and uses the Stetefeldt furnace for roasting. This is a somewhat remarkable mine on account of the persistency of the vein and its richness, but more especially on account of the large amount of water which has to be contended with. As much as 6,000 gallons are discharged from the mine per minute. This collection includes a very full series of the ores taken from different parts of the mine, selected by Captain Keith; several average samples of the ore as delivered to the mill; the dried ore; the stamped ore; the salt in lumps, dried and crushed; the mixture of the ore and salt ready for the roasting furnace; the roasted ore taken from the bottom of the stack; the roasted ore taken from the return flue, and samples taken from each one of the twelve dust chambers; the amalgam produced by treating the roasted ore in pans with mercury; the base bullion produced from retorting the amalgam, which is from 600 to 800 fine; and the tailings as discharged from the mill. In making this collection the curator was assisted very materially by Mr. Joseph Gallagher, the superintendent of the mill, and the Museum is much indebted to Mr. R. C. Chambers, the general manager of the company, for the facilities cheerfully afforded in making this collection. Two collections were also made by the curator at Butte, Mont., representing the same process. The series of specimens are essentially the same as that from Park City, but the course of operation is somewhat different, owing to the different character of the ores. At the Moulton Mill, where every attention was shown the curator by Mr. J. K. Clark, the manager, the ores are dried on plates and roasted in a Howells revolving cylinder. Besides the hard unaltered ores of the Moulton Mine this mill works a considerable amount of custom ore from many different outlying mines, especially the soft surface ores which have undergone a great deal of alteration. At the Lexington Mill, which works only the ores of the Lexington Mine, the ores are dried in a Stetefeldt shelf-drier and roasted in a Stetefeldt furnace.

In the extraction of silver by smelting it has been quite difficult to get a thoroughly satisfactory collection, on account of the reticence of the manufacturers as to details of the process, and also their unwillingness to allow specimens to be taken. A fairly complete collection representing the smelting of the argentiferous lead ore and the refining of the base bullion (silver and lead), at a works having at command a large *variety of ores*, was obtained from the Cheltenham Works, Saint Louis, Mo., by Mr. Gazzam. This collection represents the various ores available to these works; the fuels and fluxes used; the pig-lead produced in the blast-furnace, together with the matte, flue dust, and slag; the first skimmings taken from the softening furnace; the second skimmings from the same; the softened bullion ready for desilverizing; the zinc used in desilverizing; the zinc scum, containing the silver, taken from the desilverizing kettle; the zinc resulting from the smelting of the zinc skimmings; the litharge obtained in refining the silver; the fine silver; and the market lead. The same process, but on different characters of ores, is illustrated from the Argentine Works, Kansas City, Mo., collected by Mr. Zukoski, and from the Germania Works, Salt Lake City, collected by Messrs. Reckhart and Pearis. Refining of base bullion is illustrated from the works of E. Balbach & Son, Newark, N. J., collected by Mr. McIntosh. The smelting of argentiferous lead (base bullion) is illustrated from the Horn Silver Smelter, Francklyn, Utah, collected by Mr. Reckhart. This base bullion is refined at Chicago, but the process is not represented.

No collections were made representing the application of silver, but it is very desirable to do so as soon as possible.

Tin.—It has been generally supposed that tin was a rare metal in this country. This, however, is only partially true, the occurrence of cassiterite, the binoxide of tin, in small quantities, being known to mineralogists from a large extent of territory for many years; but it is only in very rare instances that this occurrence gave even the slightest evidence of there being a deposit which would prove of any commercial value. The first discovery that was at all favorable was made by Professor Jackson in New Hampshire in 1840. Specimens of this ore, together with a bar of tin produced, have been in the Museum many years.

A small amount of cassiterite from two localities, together with a bar of the tin produced, from Montana, was exhibited at the Centennial. An ore of a different character, being a stanniferous wolfram, has been known in California for many years, and at one time quite extensive operations were commenced upon the deposit. The ore, however, is somewhat difficult of treatment, and this, with litigation, soon closed up the mine and the works. There are in the Museum several specimens of this ore, together with two full-sized pigs of tin produced and several sheets of tin-plate. Isolated specimens of cassiterite have been found at various times from several localities in Maine, and the next discovery of any importance was at Winslow, in that State, where a more definite vein carrying cassiterite was discovered in 1867. The vein here, however, was exceedingly small, and nothing has been accomplished. Following close upon each other, in 1882–'83, there were discoveries of tin in three widely separated localities, which have given promise of ultimately producing more or less tin. These localities are at the Broad Arrow mines, in Alabama, a collection from which was sent to the Museum soon after its discovery; the Cash mines, in Rockbridge County, Virginia, and the deposits at Harney Peak, in the Black Hills of Dakota. In 1884 a further discovery was made at King's Mountain, North Carolina. All the latter localities were not previously represented in the Museum, and in order to make the series as full and complete as possible a special effort was made to complete the representations. With one exception this has been entirely successful. The new collections were received from Maine, Virginia, North Carolina, and the Black Hills. In the latter case, however, the representations are not at all complete, but a full series has been promised the Museum by the owner of the Etta, which is the principal mine of the region.

A complete series of tin plate of Welsh manufacture was presented to the Museum by Merchant & Co., of Philadelphia. This shows plates of charcoal iron, coke iron, and Bessemer steel coated with various thicknesses of tin, giving the different grades and varieties for different uses.

Antimony.—The occurrence of antimony in this country in workable deposits is somewhat limited. The ores of Kern County, California, were partially represented in the Centennial material, but some additions are desirable. New material from the Utah locality was obtained from Professor Clayton. This represents the ore in several varieties, including the very pure and unaltered stibnite and its oxydation products, together with the metal smelted from it. The very interesting and promising deposits of Southwestern Arkansas are not represented in the Museum, but it is hoped that a suitable series of specimens from that region can be obtained at the close of the New Orleans exposition.

Lead.—The extraction of lead alone is somewhat limited, owing to the fact that so much lead is produced from the refining of the argentiferous leads of the Western countries; the advantage gained by the presence of a small amount of silver in the ore being so great that non-argentiferous ores for the most part cannot be smelted except under the most favorable conditions. The Missouri lead region is still able to compete with this argentiferous material, however, and the processes followed have been very fully illustrated. The collections include two series from the Saint Joe and Desloge Works, at Bonne Terre, Mo., collected by Mr. J. F. Kemp. These collections are especially interesting from the large number of specimens they contain illustrating the process of the mechanical dressing or concentration of the ore. The galena occurs disseminated through a magnesian limestone or dolomite, and the process of concentrating this galena mechanically has been brought to a high state of perfection. Besides these dressed specimens the collections include the fuels and fluxes, the pig-lead produced, together with the matte and slag, the skimmings from the refiner and the refined pig. An entirely similar collection from Mine La Motte, Mo., was made by Mr. Gazzam. This collection, however, has farther value and interest from the occurrence of nickel and cobalt in the Mine La Motte ores.

One of the most interesting of metallurgical operations is carried on at the Lone Elm Works, Joplin, Mo. It is the production of a pig-lead and a white lead direct from the ore in two operations. It is a process that is only applied here and is not very well known. This collection includes the ore, the fuels, and fluxes, with a large series of the flue dusts, the pig-lead and slag obtained in the first operation; the flue dust after it has been ignited; a large series of white flue dusts obtained in the second operation; and a material known as white lead, which is used extensively as a paint, but which differs completely from the white lead obtained by corroding pig-lead. This material is mainly a sulphate of lead, containing, however, a considerable amount of zinc, which comes from zinc minerals found associated with the galena in the ore, while the white lead obtained by corroding pig-lead is a basic carbonate of lead.

Illustrations of the application of lead are somewhat numerous in the Centennial collections, but there is an opportunity to make several important additions. The only one, however, that was secured last summer was an interesting collection showing the manufacture of white lead by the corrosion process. This collection includes the metallic lead arranged in crucible for corrosion, acetic acid used, the bark with which the pile of crucibles is covered and upon fermentation furnishes the necessary carbonic acid, the white lead obtained in the crucibles, the finished white lead, and the white lead ground in oil. To these are added specimens of litharge, red lead, and orange mineral.

Copper.—Illustrations of the free copper ores from Lake Superior contained in the Centennial material, although quite full and extensive, were not at all systematic, and Messrs. Kirby and Zukoski being in the Lake Superior region when they commenced collecting, it was thought best to have them commence by making some systematic collections there. The copper occurs at Lake Superior in three distinct forms:

First, the so-called mass mines, which are characterized by the occurrence of large masses of free copper, amounting in some cases to many tons of metal in a single mass. Besides these large masses these mines also carry considerable disseminated free copper.

Second, the amygdaloid mines, which are characterized by the occurrence of the free copper in amygdules, bunches, strings, and sheets, from the size of a pin-point up to a few hundred pounds in weight (with rarely a large mass) disseminated in a soft amygdaloid trap-rock. The average percentage of copper in the ores from these mines varies from three-quarters of 1 per cent. to 2 per cent.

Third, the conglomerate mines, which are characterized by the occurrence of the free copper mostly in strings in a hard conglomerate of ferruginous quartz pebbles. The average percentage of copper in the ores from these mines varies from 4 per cent. to 6 per cent.

To illustrate the occurrence of mass copper Mr. Zukoski made a collection at the Central Mine. This collection includes sections of the formations beginning with the hanging wall and following through the vein to the foot-wall, taken from several levels, isolated specimens showing the associates of the ore, several pieces of the copper, the chips obtained in cutting up the masses, and a large and a small mass. This collection includes 34 specimens.

To represent the amygdaloid mines Mr. Kirby made a collection at the Osceola Mine. On account of the more varied character of the amygdaloid material this collection is much larger than the one from the Central Mine, but it is taken on the same general principle of representing the vein by sections from the hanging wall across the vein to the foot wall, and also in illustrating the changes of the material as one proceeds down the mine. The collection includes about 80 specimens and is a very complete illustration of the subject.

To illustrate the extraction of the copper from the amygdaloid ore Mr. Zukoski made a collection at the Osceola Mill. This includes the average of the material sent to the mill, specimens of crushed material as it passes the sieve, the headings from the mortars, and follows through the process of concentration, showing the concentrated copper and the waste products of each operation.

To represent the conglomerate mines Mr. Kirby made a collection at the Delaware Mine. This collection is taken on the same general plan as the others, and also includes a section of 631 feet along the vein, showing the various changes that take place in the material. He also collected a full series representing the concentration of the copper. This collection includes 100 specimens.

These three collections together represent in a very full manner the interesting occurrence of free copper in the Lake Superior region, and will be an exceedingly valuable addition to that subject.

It was very unfortunate that the process of refining this material could not have been followed out on the spot, but the proprietors of the refining works at Hancock would not permit any systematic collections to be taken. The only collections taken there were a short series collected by Messrs. Kirby and Zukoski illustrating the smelting of the slags obtained in refining the native copper in a McKenzie cupola at the Lake Superior Native Copper Works.

The process of refining the material from the Mass Mine is fully illustrated by a collection from the C. G. Hussey Works at Pittsburgh, Pa. This collection includes the various grades of material received from the concentrating works, a sample of the metal taken from the bath just after the first skimming of slag, a sample taken just before beginning to rabble, a sample after rabbling, a sample just before poling, and a sample of the refined metal, together with four skimmings of slag. To these are added samples of the coal and charcoal used, of the sand for making the bottom of the furnace, a piece of the pole used in refining, and a test ingot showing the tests applied to the metal just before beginning to cast. This collection was made by Mr. W. H. Johns.

The illustrations of the extensive deposits of copper at Butte, Mont., formerly obtained, were confined to one mine, but the curator collected an extensive series last summer, representing the sulphides of copper and iron and the association of free silver with these sulphureted ores.

Illustrations of the process of smelting as far as carried on at Butte, Mont., were also collected by the curator. These include series of specimens from the reverberatory furnaces of the Montana and the Parrot Companies and the shaft furnaces of the Bell Company. They include samples of the ore of various grades, with the products and waste products of the concentrating operations, the fuels and fluxes, and the matte and slag produced. As most of the matte is shipped to England for further treatment, it was not possible to follow the process beyond this single operation.

The very interesting process of smelting and refining copper from the calcopyrite ore of Saint Genevieve, Mo., is fully illustrated by a collection made by Mr. Gazzam. This collection includes a full series of the ore and a full series of the slag produced in the roasting process, together with the matte and a series of slags from the refining furnace, an ingot of the refined metal, and the copper mold in which the ingot was cast. To these are added the fuel and fluxes used and other necessary material.

The smelting and refining of copper, as carried on at works having at command a varied supply of crude materials, is illustrated by a collection from the Baltimore Works of Pope, Cole & Co., Baltimore, Md. This includes a series of mattes, together with the slags produced at the same time, and an ingot of the refined metal.

Steps were taken to obtain illustrations of the smelting of the copper of the Arizona and New Mexico region, but on account of the inability of the Museum to send a collector there and the difficulty of making arrangements by correspondence in time no series was obtained, although one is promised and will probably arrive soon.

The process carried on in Arizona produces pig copper at a single operation. The refining of this pig copper, however, is illustrated by a very full and complete series of specimens taken by the curator at the works of the Ansonia Brass and Copper Company, Ansonia, Conn. This collection includes two series of specimens taken from two different classes of furnaces working the copper from two regions. Beginning with the metal as soon as it was melted in the furnace samples were taken to represent the various stages in the process until casting was commenced. Each series contains nine specimens. Samples of the slags produced were also taken. To these were added the fuels and other necessary material used.

A very complete illustration of some of the uses of copper was presented by the Ansonia Brass and Copper Company. This series includes specimens representing the rolling of copper into various commercial shapes, the manufacture of various styles of sheet metal with copper for a basis, the manufacture and utilization of brass in various forms, and the manufacture of copper and brass wire. The collections illustrating copper and brass are the most full and complete that we have. There are, however, still a few methods that it would be very desirable to fill as soon as convenient.

Bismuth.—The occurrence of bismuth in this country is somewhat limited, having been found in only a few localities, and there only in small amounts. None of the ore is treated in this country, but occasionally small amounts are shipped abroad that have been obtained in mining for other metals. A small collection of the ores of Utah was obtained from Prof. J. E. Clayton.

Nickel and cobalt.—No new collections were made to represent nickel and cobalt as there is already a pretty fair illustration of these two metals in the Museum. It would, however, be very desirable to obtain a few specimens representing the great progress that has recently been made in the manipulation of wrought nickel.

Iron.—The very extensive collection of iron ores turned over to the Museum by the Census furnishes a very complete illustration of the iron resources of the country, and there was no necessity for making any further collections of iron ores save to go with the collections representing the processes.

To represent the smelting of pig-iron, representative furnaces were selected in different parts of the country, using different varieties of fuel. It was not, however, possible to obtain all the collections in this line that were planned. As representing the application of coke as a fuel, collections were received from the Rockwood Furnaces of the Roane Iron Company, Chattanooga, Tennessee; from the Longdale Furnaces in Virginia; from the Missouri, Nova Scotia and Saint Louis Ore and Steel Company, in Missouri. As representing the use of a mixture of coke and anthracite coal, collections were received from the Warwick and North Cornwall Furnaces in Pennsylvania, and from the Crown Point Furnace in New York. These collections include hand specimens of the ores, limestone and the fuels, and a series of pig-iron representing as far as possible the different grades produced at each furnace. With these are specimens of the slag corresponding with each grade of iron, the slag specimens when possible being taken from the same cast that the pig-irons were. To these are added specimens of by-products such as cadmia, flue dust, salamanders, &c.

The manufacture of wrought iron direct from the ore is represented by a collection from the Belmont Forge, Rogersfield, N. Y.

A very interesting collection of Swedish irons was presented by Mr. N. Lilienberg, of New York. This contains samples of various kinds of pig-iron, wrought iron, and steel, together with descriptions of the various processes used in their manufacture.

The manufacture of steel was perhaps better illustrated in the Centennial material than any other metal. But these collections were exceedingly fragmentary and consisted for the most part of highly wrought specimens, showing more particularly what can be done by suitable treatment of the material rather than what is accomplished in the everyday run of the works, and contained but few illustrations of the regular course of operations. This material therefore requires to be supplemented very extensively in order to form anything like a complete illustration. In the new collections the manufacture of Bessemer steel is most fully illustrated by a series of nearly 100 specimens collected by Messrs. Kirby and Zukoski at the South Chicago Rolling Mill. This collection begins with the smelting of the pig-iron, shows various ores, fuels, and fluxes used, and the pig-irons and slag produced. Then, beginning with the blow No. 13,391 in the converting department, specimens of all the material entering into the blow were taken and also samples of the metal taken at various times during the conversion and a sample of the finished steel rail. To these are added samples of the various refractory materials used, together with a large number of by-products produced, some of which, however, find application. This collection is an exceedingly valuable one and will add very greatly to our previous collections in this line.

The process of the manufacture of crucible steel is one but little known to those not directly interested in it, and it is not very easy to gather any specimens of the operation of the process, to say nothing of getting a complete series. Most manufacturers have what they consider exceedingly valuable secrets in this process and are very reluctant to give any information whatever in regard to their works. A very complete and interesting collection, however, was presented by Messrs. Miller, Metcalf & Parkin, of the Crescent Steel Works, Pittsburgh, Pa.

Iron being the most important metal that we have, its metallurgy is the most full and complete, and it is a subject that the Museum should illustrate fully. At the same time the industry is scattered over such a wide area that it will require a considerable time to work it up fully and completely. But it is hoped that several collections which were promised for the New Orleans Exposition will yet be received and that we shall soon have a tolerably fair illustration of the subject.

Zinc.—A very large collection of blende, much of it crystallized, from Missouri, was made by Messrs. Kirby and Gazzam. The particular mines to be mentioned are Cowen & Bliss, at Lehigh, Mo., and Spencer & McConey, Carterville, Mo. Two collections of silicate and carbonate ores from Virginia and Tennessee were obtained: one, representing the very remarkable deposit of the Bertha Zinc Company, in Pulaski County, Virginia, was presented by Mr. Thomas Jones; the other, representing the deposit at Mossy Creek, Tennessee, was presented by Mr. T. H. Heald, Knoxville, Tenn.

The collections representing the smelting of zinc or spelter from the sulphide ores of Missouri and Kansas are very complete, having been obtained from the Glendale Works, near Saint Louis; the Joplin Works, Joplin, Mo.; the Granby Works, Granby, Mo.; the Lanyon Works, Weir City, Kans., and from the South Side Mining and Manufacturing Company, Galena, Kans., by Mr. Gazzam. Collections from the Rich Hill Works, Rich Hill, Mo., and the Cherokee Works, Weir City, Kans., were obtained by Mr. Zukoski. Although these works employ similar material yet they vary greatly in detail, some of them being even totally different. The collections represent the ore in its various stages of preparation for the smelting, the fuels and fluxes used, the charge as made up for the retorts, the spelter produced, the slag and blue powder. To these are added, in many instances, illustrations of the refractory materials used and the process of the manufacture of retorts. There are several other works that it would be very desirable to represent, as they employ an entirely different character of material, and it is very desirable also to obtain collections from some of these as soon as possible.

The utilization of the complicated material occurring at Franklin, N. J., is a very interesting process, as it illustrates the extraction of three common metals from a single ore in two operations. The ores of this region consist of Franklinite—a zinc, iron, and manganese mineral—zincite, the red oxide of zinc, willemite or silicate of zinc, callimine or hydrosilicate of zinc, and rhodonite or silicate of manganese, occurring for the most part in a gangue of carbonate of lime. For smelting, these ores are first roughly divided into two classes, one containing zinc only, and the other zinc, iron, and manganese. The first class is treated for the production of spelter in the regular way. The zinc, iron, and manganese portion is treated first in a special furnace for the production of oxide of zinc, which is used largely for paint. The residue remaining in the oxide furnaces, which is known as residuum, is then treated in a shaft-furnace, for the extraction of its iron and manganese in the form of spiegeleisen for use in the manufacture of steel.

The collection from the zinc furnaces shows—

The Franklinite ore, consisting of a mixture of Franklinite or protosesquioxide of iron with zinc and manganese replacing the iron, zincite or oxide of zinc, willemite or silicate of zinc, calcite or carbonate of lime; in lumps as mined, from the Buckwheatfield Mine, Franklin, Sussex County, New Jersey.

The same ore crushed ready for the furnace.

The Franklinite ore, consisting of a mixture of Franklinite or protosesquioxide of iron with zinc and manganese replacing the iron, zincite or oxide of zinc, willemite or silicate of zinc, rhodonite or silicate of manganese, and calcite or carbonate of lime; in lumps as mined, from the Sterling Hill Mine, Ogdensburg, Sussex County, New Jersey.

The same ore crushed ready for the furnace.

The silicate and carbonate ore, consisting principally of calimine or hydrated silicate of zinc with a little carbonate of zinc resulting from decomposition, in lumps as mined, from the Sterling Hill Mine, Ogdensburg, Sussex County, New Jersey.

The same ore after roasting to expel water and carbonic acid.

The roasted ore crushed ready for the furnace.

Anthracite coal used for heating purposes.

Anthracite coal (fine) to be mixed with the ore in making up the charge to reduce the zinc to the metallic state.

The mixed charge of Franklinite ore and coal ready for the oxide furnace.

The mixed charge of silicate and carbonate ore with coal for the spelter furnaces.

The residuum remaining in the oxide furnace after the extraction of the zinc.

The oxide of zinc produced.

The residue remaining in the retorts after the distillation of the zinc in the spelter furnaces.

Blue-powder, a by-product, consisting of a mixture of metallic zinc and oxide resulting from imperfect condensation of the zinc.

The spelter or metallic zinc produced.

To these are added—The fire-clay from Woodbridge, N. J., used for making retorts.

A piece of new retort.

A piece of old retort.

Old retort ground, to be mixed with the clay in making new retorts.

The collection from the spiegel furnaces shows—

The residuum from the oxide furnaces, containing the iron and manganese originally present in the ore.

Limestone used for flux, from Sing Sing, N. Y.

Anthracite coal used for fuel.

The slag produced.

Oxide of zinc deposited in the gas-flues.

The spiegeleisen produced.

Sulphur.—The manufacture of sulphuric acid from iron pyrite is a process that has recently been very largely adopted in this country. Various strong prejudices existed formerly against the use of pyrite for this purpose on account of the liability of a small amount of arsenic occurring with the pyrite—this arsenic injuring the acid produced for many purposes. Recently, however, two very important deposits of pyrite which are totally free from arsenic have been developed, and the material is being used quite freely for the manufacture of sulphuric acid. The deposit at Charlemont, Mass., is represented by a collection of the lump and fine ore presented by the Davis Company of Boston. The deposit at Tolersville, Va., is represented by an extensive series of samples of the lump and fine ore in several varieties, together with many of the associates of the deposit. Presented by Mr. W. H. Adams.

The pyrite is first roasted to expel its sulphur, which is then converted into sulphuric acid in the regular way. The residue, which generally contains a valuable amount of copper, is then treated for that metal. The manufacture of sulphuric acid is represented by a collection presented by the Merrimac Chemical Company of Boston, Mass. It shows the lump and fine ore, the residue remaining after the extraction of the sulphur, the chamber acid, and the concentrated acid produced.

Coal.—Mr. James Temple Brown, of the Museum staff, was engaged during the summer in making a collection to represent the coal mining industry of the country. This collection contains many specimens illustrative of the life of the coal miner as influenced by his occupation and surroundings. And though the work was based mainly upon the ethnological aspect of coal mining, the collection possesses many other features which are of interest.

It embraces the carbonite or natural coke and the bituminous coals of the Jura-Triassic period from the Mesozoic formation of Virginia; the cannel, gas, splint, bituminous, and semi-bituminous coals of West Virginia; the semi-bituminous and anthracite coals of Pennsylvania; anthracite from the Carboniferous formation of Rhode Island; anthracite from the Lower Carboniferous or Vespertine of Virginia, and examples of industrial coke from several localities. Whenever possible refuse or extraneous matter, as slate, bone or bony, and bisulphide of iron (pyrite), or "sulphur," was added to the suites of samples from many mines represented. As an illustration of the collections made, that from the Philadelphia and Reading Coal and Iron Company of Pottsville will be mentioned. It consists of coal, "run of mine," from the mammoth bed in Kohinoor colliery, including a large piece weighing about three tons; slate from both the roof and floor of the breast whence the coal was taken; the marketable sizes of coal as prepared in the breaker, including buckwheat, pea, chestnut, small stove, large stove, egg, broken, steamboat, and lump or furnace; and three kinds of refuse, denominated "breaker waste" (embracing pieces of slate that form the layers between the benches of coal), bony coal, and dust. The last named is too fine to have any commercial importance, and the first two were unavoidably mixed with the coal when blasting it out in the mine. To this collection of coal is added a very large and complete exhibit of the various tools used by the coal miner, together with many specimens illustrating his social condition.

The names of the collieries which contributed to the collection, and their locations, are as follows: Commencing east and proceeding south we can trace the coal fields in their geological order. The old anthracite mine at Newport, R. I., through the kindness of Prof. R. D. Lacoe, of West Pittston, Pa., is represented by several pieces of very hard coal, graphitic in its nature, and of steel-blue color. Examples of the hard anthracite of Pennsylvania were obtained from the Mammoth bed in Kohinoor colliery, in the Shenandoah basin of the Middle Coal Field.

This colliery is operated by the Philadelphia and Reading Coal and Iron Company. The soft or free-burning anthracites were obtained from the Brookside colliery, a very pure variety, from the Lykens Valley district, and the Loyalsock mine in Sullivan County. For convenience of reference, the Geological Survey of Pennsylvania has designated the Bernice basin, in which the Loyalsock mine is located, as the Western Northern Anthracite Field. The Pennsylvania semi-bituminous coals were obtained from the basins north of Bernice, the Long Valley mine in the Barclay basin, the Arnot and Antrim mines in the Blossburg basin. The bituminous coals of Virginia were obtained from the Richmond basin, lying within the limits of Henrico, Chesterfield, Goochland, and Powhatan Counties. A specimen of anthracite from the vespertine of Virginia was presented by Col. Philip G. Pendleton, of West Virginia, and came from Berkeley County, near the line of Morgan County, West Virginia.

In West Virginia the Eagle, Crescent, Coal Valley, Paint Creek, Winifrede and Peerless mines, in the Kanawha district, contributed specimens of coal, including cannel, gas, splint, and bituminous, with their associates, to the collection; and from the New River district examples of coal and slate were forwarded to the Museum from Stone Cliff, Nuttallburg, Fire Creek, and Caperton. Coke was also received from some of them.

Coal and sand rock were obtained from the crest of the arch of an anticlinal axis on the east end of Mine Hill, in Schuylkill County, Pa., where the Coal Measures cross over from the Schuylkill basin, and a piece of coal that was evidently the crest of a miniature axis from the Palmer Vein colliery.

Forty-eight hour coke and seventy-two hour coke, of especial importance for metallurgical purposes, and the different sizes of crushed coke for domestic use, are fully represented; examples of the former were received from both Pennsylvania and West Virginia, and of the latter from Connellsville, Pa. The preparation and shipment of domestic sizes of coke is a new departure in the coking industry. This suite of samples was solicited by the curator, and consists of pea, nut, small stove, and egg, together with the lump coke and the coal from which the coke is made, and was contributed by the H. C. Frick Coke Company of Pittsburgh, Pa.

Samples of pyrites were obtained in well-defined cubes, and in crystalline aggregates, from the washings of coal in a jigger, finely disseminated in slate, and in ovoid and globular masses of greater or less diameter in the coal itself. The latter are called "sulphur balls" by the miners, and their presence is strongly objected to, as they are impervious to the pick and a source of considerable annoyance and delay in cutting coal. They are also a source of danger in "fiery" mines on account of their hardness, which causes them to throw off sparks of fire *(strike fire)* when struck with sufficient force with a pick or other tool.

Among the curiosities of the collection may be mentioned pieces of iridescent or "peacock" coal, so called on account of its brilliant metallic colors. Anthracite, semi-anthracite and semi-bituminous coals of this character are represented; the handsomest specimens being from the Ross vein of the Red Ash Coal Company of Wilkes Barre.

As an evidence that the miner is warmly receptive to art, and as an illustration of the adaptability of anthracite coal to such purposes, several coal ornaments were obtained: (1) a lady's slipper, (2) a miner's brogan, (3) a table caster with bottles, and other articles made by the artistic miner in his leisure moments. The first is a very beautiful specimen, and is not only artistic but also highly realistic. These were presented by Mr. P. W. Sheafer and Maj. Heber S. Thompson, of Pottsville. The first is made of coal from Kohinoor colliery, the second from one of the mines on the Girard estate, and the third from the Ellangowan colliery. Major Thompson also donated two cubes of anthracite coal. One is a 4-inch cube, and the coal was mined from the top split of the mammoth bed in the Hammond colliery. It contains 64 cubic inches and weighs $3\frac{11}{32}$ pounds, equivalent to $2574\frac{9}{32}$ pounds, or 1.149 tons, per cubic yard. The second is a 10-inch cube, and is from the mammoth bed (white ash), Kehley's Run colliery.

The number of fossil plants in the collection is small and restricted to well-known varieties, such as stigmaria, sigillaria, lepidodendra, ulodendra, and calamites. Impressions of fern-leaves in both fire clay and slate should also be noted. One of them, with a silvered matrix, presented by Mr. P. W. Sheafer, is unusual. An example of ulodendron is very pronounced in its bars, a feature which has given rise to the name of "washboard slate" in use by the miners.

The corrosive effect of mine water upon metals is illustrated by several bolts from a large tubular iron tank used to hoist water from mines. The bolts, originally $\frac{3}{8}$ of an inch in diameter, have been eaten away to a mere shred. A mining pick taken from an abandoned colliery shows the effect of mine water upon iron and steel combined, the iron has been eaten away to a large extent while the steel is only slightly attacked.

The objects of geological interest are supplemented by the various kinds of implements used by the miner, consisting of his tools, lamps, clothing, and foot-wear, as well as utensils that pertain to his domestic economy and are essential to his personal comfort while at work. This list embraces the pick, drill, needle, blasting-barrel, cartridges, and all accessories used in the processes of cutting and blasting coal; lamps which burn with a naked flame for the mine officials, miners, drivers, and mules; and safety lamps of various patterns, including the Clanny, Davy, and Stephenson. The safety lamps were presented by Messrs. J. W. Queen & Co., of Philadelphia, who also contributed samples of brattice cloth, an air-tight fabric of coarse texture used in ventilating mines. The miner's outfit is further illustrated by an industrial exhibit which includes in their regular order the several parts used in the process of manufacturing miner's boots, and also embraces both kinds of mining boots used by the miner, in the hard coal and soft coal mines respectively. This exhibit was prepared and presented by Messrs. Humphrey Bros. and Tracey, Towanda, Pa. An improved form of the Grim drill, or coal auger, donated by Mr. I. F. Mansfield, Cannelton, Pa., is shown. The Blossburg Coal Company presented a ratchet-drill which may be used alternately in boring rock for tunneling and enlarging gangways, and for excavating coal. This is a fair illustration of the workmanship of the local artisans employed at our coal mines, and was made by the blacksmith at Arnot.

In addition to the utensils used in excavating coal a set of hand implements or "breaker tools," used in the breaker while preparing the coal for market, may also be noted. It comprises a rake and scraper for manipulating the coal in the chutes and a wire broom for cleaning the meshes of the large rotating cylindrical screens that distribute the marketable sizes of coal and to detach slate.

The pictorial portion of the collection consists of (1) photographs, including negatives and prints; (2) tracings and sketches on linen cloth; (3) lithographs, and (4) cyanotypes. This collection illustrates the processes of mining by drift, slope, and shaft; the miners in their different positions when engaged in cutting and drilling coal; the working costumes of the miners and mine officials; the excavation of coal by the pick and mining machine or "coal digger"; the inside and outside haulage of coal by means of the mule, mine locomotive, and the underground wire-rope system; the machinery for hoisting coal to the surface; pumping machinery; ventilating fans and fan-houses; exterior and interior views of the breaker, where the large lumps of coal are broken and the various sizes assorted for market; the chutes and pockets for loading coal at the colliery for transshipment; the transfer of the coal up and down the precipitous sides of the mountains by inclined planes; the form of mine wagons used in the anthracite collieries and the bituminous mines; the formation of a coal seam, showing the partings of slate between the benches and the crest of an anticlinal where the measures cross over a mountain from one basin to another, and coal-washing machinery.

Twenty-one negatives were made in all; five in the soft-coal region and sixteen in the anthracite. By means of electric light five negatives were made of the interior of a mine showing miners at work, as well as of the electric plant used upon the occasion. The views were enlarged by Mr. T. W. Smillie, photographer of the Museum.

These views represent—

Three miners at work, one with a hand-drill or jumper, making a hole for a shot, one with pick breaking down coal, and the third in the act of loading small pieces of coal with shovel; this also shows the different benches, including the 12-foot bench and the leg-breaker, and a pile of "gob." (59006.)

The same breast as 59006, with a miner at work with a hand-drill or coal-auger by the light of the safety-lamp, various tools being grouped about him. (59008.)

Robbing the mine. Two men at work with the ordinary miner's lamp, one with pick and the other with shovel, a pillar of coal on the right. (59007.)

A view of the entrance to the breast, taken from the face, representing the manner of propping the gangway, and showing the mule-track, a pile of gob, and discarded props on the right. (59009.)

A view of the electric plant used in taking the photographs. (59010.)

Photographs of mine locomotives were obtained from the Wyoming Valley Manufacturing Company, Wilkes-Barre, Pa., and two photographs of a fan and fan-house for mine ventilation from the Vulcan Iron Works of the same place. In this series the engines used for both inside and outside mine service are fully illustrated. One of the originals is used at Arnot, Pa. (inside), and another at the Raton mines, New Mexico (inside), and the third at Nanticote, Pa. (outside). A photograph of the Harrison mining machine, with a miner in position for cutting coal, was presented by Mr. George D. Whitcomb, Chicago, Ill. A photograph of an apparatus for the inside haulage of coal by the tail-rope or endless-rope system, showing double engines of 100 horse-power and drum, was presented by Mr. Thomas E. Knauss, superintendent of the Nelsonville Foundry, Nelsonville, Ohio. This machinery, together with the photographs of the mine locomotives, fully illustrates the improved mechanical devices for both the excavation and the haulage of coal. Mr. George M. Bretz, photographer, of Pottsville, Pa., who made all the negatives in the collection illustrative of typical mining scenes both above and below ground in the anthracite regions, has sent several large photographs of representative breakers in the Shenandoah district and one photograph of the Mahanoy plane. This series includes the William Penn colliery breaker, the Lost Creek colliery breaker, and the Kohinoor breaker. Mahanoy plane is about half a mile long and about 16,000 tons have been hoisted over it in one day. Mr. Thomas Hodgson, of Buffalo, N. Y., has contributed two large photographs, illustrative of the transfer of anthracite coal to the Great Lakes for western shipment; one picture represents the land view, and shows the manner of discharging coal from the railroad cars into the pockets, and the other the water view, and the manner of loading vessels.

Mr. C. A. Ashburner, in charge of the survey of the anthracite-coal fields of Pennsylvania, contributed three enlarged charts, illustrating (1) the Panther Creek Coal Basin; (2) cross and columnar sections of the same, and (3) the Wyoming Valley in the vicinity of Wilkes Barre. Mr. J. Raymond Claghorn, of Philadelphia, president of the State Line and Sullivan Railroad Company, contributed a topographical map of the Loyal Sock Coal Basin in Sullivan County, Pennsylvania. The Pennsylvania Coal Company contributed a lithograph of its Barnum colliery breaker at Pittston, Pa. Mr. A. B. Cochrane donated a chart of the anthracite coal fields of Pennsylvania and their outlet to market, including a list of the names of the collieries and a statistical table showing the annual shipment of coal.

Mr. P. W. Sheafer, of Pottsville, sent several tracings, one which represents the columnar section of the coal measures in the vicinity of Kohinoor colliery, Schuylkill County, Pennsylvania, and another a section of the mammoth bed in the same colliery, showing the top and bottom splits, and the partings of slate, charcoal, and bone; also a diagram of the progress of the anthracite coal trade of Pennsylvania, with a statistical table showing the output and estimated quantity of anthracite coal in the several coal fields and the relative amount of waste. Mr. John H. Strauch, resident engineer of the Philadelphia and Reading Coal and Iron Company, sent two tracings; one represents the underground operation of the standard 20-inch bull-pump used in draining the mine, including cross-sections of the main gangway and sump, and the pump and wagon ways of the pump-slope; the other shows the manner in which the two shafts of this collery were sunk, and indicates, with full measurements, the positions of the diamond-drill holes used in blasting the rock. Mr. John A. Pollard, resident engineer of the Shenandoah district of the Philadelphia and Reading Coal and Iron Compay, has supplied an excellent sketch of the ground view of Kohinoor colliery, with tidal elevations, illustrative of the photographic work conducted in that collery last summer. Mr. E. F. C. Davis, superintendent of the Philadelphia and Reading Coal and Iron Company's Pottsville shops, has sent a tracing and cyanotype of the indicator cards from the steam-engine used to drive the dynamo in the Indian Ridge colliery September 6, 1884.

Two cyanotypes of coal-washing machinery, showing the construction of the building, and the general interior arrangement, were donated by Mr. S. Stutz, M. E., of Pittsburg, Pa.

At Bernice were obtained specimens of coal, rock, slate, fire-clay, mineral charcoal, and a full set of mining tools.

At Long Valley were obtained samples of coal from the top and bottom benches, slate from the roof, and fire-clay from the bottom of the mine, together with five negatives of typical scenes about Long Valley: (1) the Long Valley coal plane; (2) a group of miners in working dress; (3) a coal trip emerging from the mouth of the drift; (4) exterior view of one of the Long Valley dwelling-houses (No. 45), occupied by Mr. Carroll, the inside superintendent, and (5) an interior view of the same dwelling.

The Pennsylvania anthracite measures attain their greatest depth at Pottsville, where they are at least 3,000 feet thick, and include perhaps thirty coal beds, of which fifteen are workable. In the Pottsville district were obtained samples of coal, slate, and bastard slate, from the Diamond and Primorose beds, and a most excellent photograph of the winding machinery at the deep shaft. Mr. Bretz made views of representative surface scenes at Kohinoor. Shenandoah City, and Ellangowan collieries, and interior views of breast 39 in the first-named colliery. In the latter, excellent views of "robbbing the mine," the formation of the coal, and miners at work, were made.

The Philadelphia and Reading Coal and Iron Company undertook to make the exhibit of coal and mining implements from the anthracite region of the Middle Coal Field.

As Mr. Brown's time was limited, he was unable to visit the Richmond coal fields, and relied upon the agents and proprietors, whose offices are in Richmond, for the samples of coal and carbonite included in the collection. The bituminous coal came from the Ætna mines, 13 miles from Richmond, on the Richmond and Danville Railroad. The natural coke, or carbonite, came from the Eureka mines, at the same locality.

Coals from the Belleville mines of Illinois were obtained by Mr. Edmund B. Kirby, and from Collinsville and Mount Olive by Mr. Edward L. Zukoski. Mr. Kirby's collection from the Belleville mines consists of slate from the roof, clay from the floor and one of the partings from the upper bench, coal from the blacksmith bench, "nine-inch" bench, drift, block, and bottom coal and iron pyrite. Mr. E. L. Zukoski's collection came from mine No. 4 of the Abbey Coal and Mining Company, Saint Clair County, Illinois, and embraces top and bottom coal, drift and block coal, overlying slate and underlying clay.

Thanks are due Mr. James Macfarlane, Mr. S. W. Alvord, editor of Towanda Review, Mr. George H. Wood, photographer, and I. O. Blight, superintendent of the State Line and Sullivan Railroad Company, of Towanda, Pa.; Mr. J. C. Guthrie, vice-president of the Blossburg Coal Company, of Elmira, N Y.; Mr. H. J. Landrus, general manager of the mine at Arnot; Mr. William Howell, of the Fall Brook Company, at Antrim; Mr. H. C. Davis, of the Barclay Coal Company, Mr. J. Raymond Claghorn, of the State Line and Sullivan Railroad Company, and Messrs. J. W. Queen & Co., of Philadelphia.

In the anthracite regions we are greatly indebted to Mr. S. B. Whiting, general manager of the Philadelphia and Reading Coal and Iron Company, of Pottsville, Pa., for material aid in making up a representative exhibit of economic geology illustrative of the anthracite regions, and mining tools and accessories used in that district; also for his zealous efforts in carrying out the proposition to photograph the interior of a coal mine. Mr. R. C. Luther, mine engineer of the Philadelphia and Reading Coal and Iron Company, and his assistants, Mr. George S. Clements, Mr. John A. Pollard, and Mr. John H. Strauch, resident and supervising engineers, were unremitting in their endeavors to facilitate the work, as were also Mr. E. F. C. Davis, superintendent of the

Pottsville shops, and Mr. William Waters, superintendent of the Shenandoah district. Special acknowledgments are due to Mr. R. W. Kear, secretary of the Arnoux Electric Light and Heat Company, of Pennsylvania, who furnished the dynamo, wire, and other material used in Kohinoor colliery, at his own expense.

Thanks are also due Maj. Jed. Hotchkiss and Mr. M. Erskine Miller, Mr. Albert Blair, Mr. J. R. Werth, superintendent of the Bright Hope Railroad Company, of Virginia; Mr. F. Howald, superintendent of the Fire Creek Coal and Coke Company; Capt. W. R. Johnson, proprietor, and Mr. Thomas A. Bartlam, superintendent of the Coal Valley Coal Company; Mr. G. C. Hewitt, general manager of the Winifrede Coal Company; Mr. N. M. Jenkin, of Stone Cliff; and Mr. J. C. W. Tomkins, president of the Cedar Grove mine, for assistance in the Virginia and West Virginia coal fields.

The collection embraces 300 objects, all of which have been duly catalogued and numbered.

Alloys.—One of the most interesting uses to which metals are put is the manufacture of alloys for different purposes. This subject had not been at all represented in the previous collections, but a beginning has now been made which is capable of being greatly extended. The manufacture of brass at Ansonia, Conn., has already been mentioned. The manufacture of type metal is very fully represented by a collection presented by Mackellar, Smiths & Jordan, of Philadelphia, Pa. This collection shows the various metals entering into the manufacture of type metal and type material and the different grades of type used for different purposes. To these are added illustrations of the steps in the progress of casting type, together with illustrations of some of the older methods. The manufacture of Babbitt, or anti-friction metal, is illustrated by collections presented by Messrs. Merchant & Co., and Paul S. Reeves, of Philadelphia. These both include samples of the metals used in the manufacture and samples of the various grades of Babbitt. Messrs. Merchant & Co. also presented an interesting series of solders of different composition for different purposes. The manufacture of a special metal for bearings, &c., is illustrated by a collection from the Ajax Metal Company, of Philadelphia, Pa.

Non metallic ores.—The manufacture of emery cloth and sand-paper is very fully illustrated by a collection presented by Baeder, Adamson & Co., Philadelphia. This collection shows the quartz and emery as mined, as ground and sorted in various sizes for making the paper, and also illustrates the extraction of the glue and the manufacture of the paper used. To these are added samples of the various sizes of emery cloth and sand-paper as put upon the market.

The occurrence and application of asbestos are very fully illustrated by a collection presented by the H. W. Johns Company, New York. This includes samples of asbestos froom fifty-five different localities, and is by far the most thorough and complete illustration of the occurrence of this material that has ever been exhibited. To this are added illustrations of the application of asbestos, including various kinds of packings and covers for heated surfaces, threads of various sizes, cloth used for various purposes, and in fact very fully illustrates the application of the material. This collection is one of the fullest and most complete that we have, and special thanks are due to the Johns Company for their care and attention in its preparation, they having gathered all the material and set it up in a very creditable manner.

The materials used for various abrading and polishing purposes are illustrated by a collection presented by R. J. Waddell & Co., New York, and a collection of tripoli in its crude and prepared shape by the Saint Louis Tripoli Company, Saint Louis, Mo. A large collection of corundum, emery, and quartz in the lump and in various sizes was presented by the Union Stone Company, Boston, Mass. The preparation of barytes for various uses is represented by a collection presented by Messrs. Page and Krause, Saint Louis, Mo.

Miscellaneous material.—The application of the regenerative system of heating devised by Dr. Siemens is very fully illustrated by a large series of drawings of furnaces for various uses presented by Messrs. Richmond and Potts, Philadelphia.

The use of the diamond drill in mining operations, especially for exploring purposes, is well illustrated by a collection presented by the Pennsylvania Diamond Drill Company. This collection includes photographs of machines suited for various characters of work, illustrations of the bit of the drill with a large number of cores taken out from different sections of the country, together with drawings showing the use that has been made of the drill and some of the results obtained.

Owing to the small space allowed the Museum for exhibition purposes at New Orleans it was not possible for this department to show anywhere near all the material collected. At the same time, in order to make the subjects as full as possible, selections were made from materials already on hand, and the subjects of Economic Geology and Metallurgy were represented at New Orleans by the following collections:

In the first division of this collection—that of Economic Geology, or the natural occurrence of materials of economic value—it is designed to exhibit collections illustrating the different kinds and grades of the ores of each metal, and also a few collections of non-metallic minerals of economic importance.

In the second division—that of Metallurgy—it is designed to exhibit collections representing the processes for the extraction of the metals from their ores by specimens, where practicable, filling the gaps by means of illustrations and descriptions and accompanying them by general illustrations and descriptions so as to fully explain these processes.

In making up the ore collection it has been designed to represent all the different varieties of each ore and many of the most prominent mining regions, so as to give a good general idea of the nature of the occurrences of the metals and also their distribution, but it has not been possible to show every occurrence of each variety of an ore, neither has it been possible to represent every mining region.

The Lake Superior copper region is very thoroughly represented, both on account of the value of the mines of this region and as representing the kind of collections it is desirable for the Museum to possess to illustrate a region or a mine.

Taking, first, the region, it is represented by three prominent mines showing three different and characteristic occurrences of the ore.

First, the so-called mass mines, which are characterized by the occurrence of large masses of free copper, amounting in some cases to many tons of metal in a single mass, are represented by the Central mine. Besides these large masses these mines also carry considerable disseminated free copper.

Second, the amygdaloid mines, which are characterized by the occurrence of the free copper in amygdules, bunches, strings, and sheets from the size of a pin-point up to a few hundred pounds in weight (with rarely a large mass), disseminated in a soft amygdaloid trap-rock, are represented by the Osceola mine. The average percentage of copper in the ores from these mines varies from three-quarters of 1 per cent. to 2 per cent.

Third, the conglomerate mines, which are characterized by the occurrence of the free copper mostly in strings in a hard conglomerate of ferruginous quartz pebbles, are represented by the Conglomerate Mine. The average percentage of copper in the ores from these mines varies from 4 per cent. to 6 per cent.

Taking the Conglomerate Mine, the collection shows, first, the general character of the ore and the inclosing wall rocks; secondly, it shows the occurrence of the ore at various prominent points in the mine which are accurately located; and, thirdly, it shows a section of the rocks over a distance of 631 feet, by specimens taken at suitable distances to show the different characters and changes of the material.

In selecting specimens it has not been designed to exhibit those that are especially handsome or rich, but rather to take such as represent the actual character, occurrence, and value of the ores. In making collections of ores for the National Museum, it is very desirable that some definite and systematic plan of representation of this kind should be adopted, as collections made in this way have far more value for Museum purposes than the hap-hazard collections of showy specimens usually found in such establishments.

COLLECTIONS IN ECONOMIC GEOLOGY.

Gold.

Placer gold, from Virginia, North Carolina, California, Idaho, Montana, Utah, and Oregon.

Gold quartz, from Virginia, North Carolina, South Carolina, Georgia, *California, and Montana.*

Auriferous gravel, from California and South Carolina.

Auriferous pyrite, from Virginia and Colorado.

Telluride ores—compounds of gold with tellurium, from Colorado.

Iridium.

Iridosmine, from California.

Silver.

Native silver with native copper, from the Lake Superior region.

Native silver on sulphide of copper, from Montana.

Wire silver, from Nevada, Montana, Idaho, and New Mexico.

Native silver and horn silver, in sandstone, from Utah.

Horn silver, from Colorado, Utah, Nevada, and New Mexico.

Ruby silver, from Nevada.

Base ores carrying silver (milling ores), from Nevada, Utah, and Montana.

Argentiferous lead ores (smelting ores), from Colorado, Utah, and Nevada.

Tin.

On account of recent discoveries and the general interest attaching to tin the list of the localities of the occurrence of cassiterite, or the binoxide of tin, has been made as complete as possible, and includes Maine, New Hampshire, Virginia, North Carolina, Alabama, Montana, and the Black Hills of Dakota. The tin ore of San Jacinto, Cal., is also shown.

With the tin ores are shown bars of tin reduced from the New Hampshire (1840), Virginia, Alabama, Montana, and California ores; also a collection of Welsh tin plate.

Antimony.

The sulphide ores, from Utah (with metal) and California.

Quicksilver.

Cinnabar, from California.

Lead.

The sulphide ores, from Missouri. (For argentiferous lead ores, see under Silver.)

Copper.

Native copper, from the Lake Superior region in Michigan, including—water-worn or surface specimens; specimens of the mass copper, and chips obtained in cutting up the masses in the mine, and specimens showing the disseminated free copper in the rock, both amygdaloid and conglomerate. To these are added specimens illustrating the dressing of the ores.

Sulphide ores, including the sulphides of copper and iron, from Vermont, Maryland, North Carolina, and Missouri, and the sulphide of copper from Butte, Mont.

Oxidized ores, from Pennsylvania, Virginia, and Arizona.

Bismuth.

The oxidized ores, from Utah.

Nickel and cobalt.

The sulphide ores, from Pennsylvania and Missouri.

Iron.

A collection of ores of over 500 specimens, selected from the collections made by the Tenth Census, under the direction of Prof. R. Pumpelly, to illustrate the iron industry of the United States, showing all the different kinds and varieties of iron ore found in this country.

This collection is not intended to show the full occurrence in any one region, but only the prominent varieties of the different regions.

Manganese.

Manganese ore from Virginia and Georgia.

Zinc.

The New Jersey ores, including Franklinite, zincite, willemite, and calamine.

The silicate and carbonate ores of Tennessee and Virginia.

The sulphide ores of Missouri and Kansas.

Coal.

A collection showing the different varieties of coal from Pennsylvania and Virginia, including anthracite, semi-bituminous, bituminous, splint, and cannel coal; also a large collection illustrating the methods of coal mining, including some large photographs (taken by electric light) of the interior of a coal mine, showing the formation of the coal-seam and its peculiarities, together with the men at work. These are the first photographs ever taken of the interior of a coal mine.

Sulphur.

Native sulphur, from Nevada.

Iron pyrites, from Massachusetts and Virginia.

Besides the above systematic ore collections, some illustrations of ores will be found in the metallurgical collections.

In making up the metallurgical collection it has not been possible to exhibit the production of each metal exhaustively, owing to the small amount of suitable material previously in the Department and to the short space of time available for making new collections.

A few systematic illustrations of metallurgical operations are shown. In making these collections it has been designed to treat a few subjects *thoroughly rather* than a large number superficially. After suitable consideration a few representative works were selected for illustration, and have been worked up as completely as possible.

Beginning with the ore as mined, each step in its preparation for smelting is shown, together with the by or waste products of such treatment. To illustrate the smelting operation, the ores, the fuels, the fluxes, and every other material entering into the operation are shown. Following through the process, each product of each operation up to the final product of the works is represented. To these are added, where practicable, illustrations of materials of construction, such as fire-clays, sands, &c. The furnaces and tools are shown by specimens, views, and descriptions. The interest and value of these collections does not lie so much in the specimens themselves as in their being thoroughly connected, and in the kind and amount of information that can be given in regard to them.

In order to be satisfactory the series must be complete, and the information full and accurate. A great deal of time, care, and attention is necessary in making such a collection.

To illustrate the nature and scope of these collections, a single one, that from the Passaic Zinc Works, will be described in detail. These works are located at Jersey City, N. J., and use the zinc, iron, and manganese ores from Franklin, Sussex County, New Jersey; they were started in 1854, and have been twice enlarged.

From 1854 to 1875 only oxide of zinc was manufactured; in 1875 the spelter furnaces were added, and in 1884 the spiegel furnace. The works have been in constant operation from the very beginning.

There are 48 furnaces, 6 by 4 feet, making oxide of zinc, arranged in double rows of 8 and 10. There are 12 spelter furnaces arranged in blocks of 4 each. The spiegel plant consists of one 9 feet 8 inches by 37½ feet blast-furnace.

The Franklinite ores are treated first in the oxide furnaces for the production of oxide of zinc and the residues containing iron and manganese are smelted in the blast-furnace for the production of spiegel.

The silicate and carbonate ores are smelted in the spelter furnaces for the production of metallic zinc.

The collection from the zinc furnaces shows—

The Franklinite ore, consisting of a mixture of Franklinite or proto-sesquioxide of iron with zinc and manganese replacing the iron, zincite or oxide of zinc, willemite or silicate of zinc, calcite or carbonate of lime, in lumps as mined, from the Buckwheatfield mine, Franklin, Sussex County, New Jersey.

The same ore crushed ready for the furnace.

The Franklinite ore, consisting of a mixture of Franklinite or proto-sesquioxide of iron with zinc and manganese replacing the iron, zincite or oxide of zinc, willemite or silicate of zinc, rhodonite or silicate of manganese, and calcite or carbonate of lime, in lumps as mined, from the Sterling Hill mine, Ogdensburg, Sussex County, New Jersey.

The same ore crushed ready for the furnace.

The silicate and carbonate ore, consisting principally of calimine or hydrated silicate of zinc with a little carbonate of zinc, resulting from decomposition, in lumps as mined, from the Sterling Hill mine, Ogdensburg, Sussex County, New Jersey.

The same ore after roasting to expel water and carbonic acid.

The roasted ore crushed ready for the furnace.

Anthracite coal used for heating purposes.

Anthracite coal (fine) to be mixed with the ore in making up the charge to reduce the zinc to the metallic state.

The mixed charge of Franklinite ore and coal ready for the oxide furnace.

The mixed charge of silicate and carbonate ore for the spelter furnaces.

The residuum remaining in the oxide furnace after the extraction of the zinc.

The oxide of zinc produced.

The residue remaining in the retorts after the distillation of the zinc in the spelter furnaces.

Blue powder, a by-product consisting of a mixture of metallic zinc and oxide resulting from imperfect condensation of the zinc.

The spelter or metallic zinc produced.

To these are added—

The fire-clay from Woodbridge, N. J., used for making retorts.

A piece of new retort.

A piece of old retort.

Old retort ground, to be mixed with the clay in making new retorts.

The collection from the spiegel furnaces shows—

The residuum from the oxide furnaces, containing the iron and manganese originally present in the ore.

Limestone used for flux, from Sing Sing, N. Y.

Anthracite coal used for fuel.

The slag produced.

Oxide of zinc deposited in the gas-flues.

The spiegeleisen produced.

The collection of specimens is supplemented by photographic views of the principal points about the works.

COLLECTIONS IN METALLURGY.

Gold.

The extraction of the free gold from the auriferous gravel of California by amalgamation: Collection from the North Bloomfield mine, Nevada County, California.

The extraction of the free gold from the auriferous pyrite in quartz of Colorado, by stamping and amalgamating: Collection from the Bob*tail mill, Black Hawk*, Gilpin County, Colorado.

The extraction of gold from the auriferous mispickel (arsenical pyrites) by roasting and chlorination: Collection from the Del Oro Works, Canada.

The extraction of gold and copper from auriferous copper ores, by the fusion and electrolytic process: Collection from the works of E. Balbach & Son, Newark, N. J.

The manufacture of gold leaf: Collection from Hastings & Co., Philadelphia, Pa.

Silver.

The extraction of silver from base ores by chloridizing roasting, and milling (amalgamation): Collection from Ontario Mill, Park City, Summit County, Utah.

The smelting of argentiferous lead ores and the refining of the base bullion (silver and lead): Collection from the Cheltenham Works, Saint Louis County, Missouri.

The refining of base bullion (silver and lead): Collection from the works of E. Balbach & Son, Newark, N. J.

Lead.

The manufacture of pig lead and white lead direct from the ore: Collection from the Lone Elm Works, Joplin, Mo.

Copper.

The smelting and refining of copper by the fusion process: Collections from the Baltimore Copper Works, Baltimore, Md., and Saint Genevieve Copper Works, Saint Genevieve, Mo.

The refining of pig copper: Collection from the Ansonia Brass and Copper Works, Ansonia, Conn.

The rolling of copper: Collection from the Ansonia Brass and Copper Works, Ansonia, Conn.

Iron.

The smelting of pig iron: Collections from the Crown Point Furnace, Crown Point, N. Y., the Rockwood Furnace, Rockwood, Tenn., and the Missouri Furnace, Saint Louis, Mo.

Steel.

The manufacture of crucible steel: Collection from the Crescent Steel Works, Pittsburgh, Pa.

The manufacture of Bessemer steel: Collection from the South Chicago Bessemer Works, South Chicago, Ill

Zinc.

The smelting of spelter or zinc: Collections from the Glendale Zinc Works, Saint Louis, Mo., the Joplin Zinc Works, Joplin, Mo., and the Rich Hill Zinc Works, Rich Hill, Mo.

Zinc, iron, and manganese.

The smelting of spelter or zinc, oxide of zinc, and spiegeleisen from Franklin, N. J., ores: Collection from the Passaic Zinc Works, Jersey City, N. J.

Coke.

The manufacture of coke at Connellsville, Pa.: Collection from the H. C. Frick coke ovens.

Sulphur.

The manufacture of sulphuric acid from iron pyrites: Collection from the Merrimac Chemical Company, Boston, Mass.

The manufacture of alloys.

Brass and its utilization: Collection from the Ansonia Brass and Copper Works, Ansonia, Conn.

Type metal and its utilization: Collection from the type foundry of Mackellar, Smiths & Jordan, Philadelphia, Pa.

Babbitt, or anti-friction, metals: Collections from Merchant & Co., and Paul S. Reeves, Philadelphia, Pa.

Solders: Collection from Merchant & Co., Philadelphia, Pa.

COLLECTIONS ILLUSTRATING THE PRACTICAL APPLICATION OF NON-METALLIC ORES.

The manufacture of sand-paper: Collection from Baeder, Adamsom & Co., Philadelphia, Pa.

Asbestos and its application: Collection from the H. W. Johns Company, New York.

Abrading and polishing materials: Collections from R. J. Waddell & Co., New York, and Saint Louis Tripoli Company, Saint Louis, Mo.

The utilization of barytes: Collection from Page & Krause, Saint Louis, Mo.

The past year has been one of great activity in this department, far more having been done than in the first year of its organization. A considerable amount of the accumulated material on hand since the department was organized in December, 1882, has now been administered upon and so disposed that far better use can be made of the material on hand, and it is much easier to see what portions of the collections most need strengthening. At the same time the more thoroughly organized the material is, the more apparent it becomes that there is yet a large amount of work in investigation needed to fit the material to accomplish the most good as an educator. Work of this character will occupy the attention of the department to a considerable extent for many years.

NOTES.

The department has had the aid during the entire year of Ensign H. M. Witzel, U. S. Navy, who rendered valuable assistance in the work of the department.

Mr. James Temple Brown, of the Museum staff, was engaged for several months in making an extensive series of collections representing coal mining, and also assisted in the work of the department both at Washington and in New Orleans.

The clerical work of the department was done during eleven months of the year by Mr. F. I. Offutt, who was assisted by Mr. W. H. Newhall for several months.

PART III.

SCIENTIFIC PAPERS ILLUSTRATING THE COLLECTIONS IN THE U. S. NATIONAL MUSEUM, 1884.

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I.—THROWING-STICKS IN THE NATIONAL MUSEUM.

By OTIS T. MASON.

Col. Lane Fox tells us there are three areas of the throwing-stick: Australia, where it is simply an elongated spindle with a hook at the end; the country of the Conibos and the Purus, on the Upper Amazon, where the implement resembles that of the Australians, and the hyperborean regions of North America.

It is of this last group that we shall now speak, since the National Museum possesses only two specimens from the first-named area and none whatever from the second.

The researches and collections of Bessels, Turner, Boas, Hall, Mintzner, Kennicott, Ray, Murdoch, Nelson, Herendeen, and Dall, to all of whom I acknowledge my obligations, enable me to compare widely separated regions of the hyperborean area, and to distinguish these regions by the details in the structure of the throwing-stick.

The method of holding the throwing-stick is indicated in Fig. 1 by a drawing of H. W. Elliott. The Eskimo is just in the act of launching the light seal harpoon. The barbed point will fasten itself into the animal, detach itself from the ivory foreshaft, and unwind the rawhide or sinew line, which is securely tied to both ends of the light wooden shaft by a martingale device. The heavy ivory foreshaft will cause the shaft to assume an upright position in the water, and the whole will act as a drag to impede the progress of the game. The same idea of impeding progress and of retrieving is carried out by a multitude of devices not necessary to mention here.

The Eskimo spend much time in their skin kyaks, from which it would be difficult to launch an arrow from a bow, or a harpoon from the unsteady, cold, and greasy hand. This device of the throwing-stick, therefore, is the substitute for the bow or the sling, to be used in the kyak, by a people who cannot procure the proper materials for a heavier lance-shaft, or at least whose environment is prejudicial to the use of such a weapon. Just as soon as we pass Mount St. Elias going southward, the throwing-stick, plus the spear or dart of the Eskimo and the Aleut, gives place to the harpoon with a long, heavy, cedar shaft, weighing 15 or 20 pounds, whose momentum from both hands of the Indian, without the throw-stick, exceeds that of the Eskimo and Aleut darts and harpoons, with the additional velocity imparted by the throwing-stick. It must not be forgotten, also, that the kyak is a very frail, unsteady thing, and therefore not much of the momentum of the body can be utilized, as it is by the Northwest Indians in making a lunge with a heavy shaft. The throwing-stick is also said by some arctic voyagers to be useful in giving directness of aim. Perhaps no other savage device comes so near in this respect to a gun barrel or the groove of a bow-gun. Its greatest advantages, however, are the firm grip which it gives in handling a harpoon or dart, and the longer time which it permits the hunter to apply the force of his arm to the propulsion of his weapon. Having practiced with a throwing-stick somewhat, I have imagined also that there was a certain amount of leverage acquired by the particular method of holding the stick and straightening the arm, as in a toggle joint. That implement, which seems so simple, and which is usually mentioned and dismissed in a word, possesses several marks or organs, which help to distinguish the locality in which each form occurs, as well as to define the associations of the implement as regards the weapon thrown from it and the game pursued. These marks are:

1. Shape, or general outline in face and side view, and size.
2. Handle, the part grasped in the hand.
3. Thumb-groove or thumb-lock, provision for the firm and comfortable insertion of the phalanx and ball of the thumb.
4. Finger-grooves, provision for each finger according to its use in the manipulation of the implement.
5. Finger-pegs, little plugs of wood or ivory to give more certain grip for the fingers and to prevent their slipping. The devices for the fingers are the more necessary where the hands are cold and everything is covered with grease.
6. Finger-tip cavities, excavations on the front face of the implement, into which the tips of the three last fingers descend to assist in grasping and to afford a rest on the back of these fingers for the weapon shaft.
7. Index-finger cavity or hole, provision for the insertion of the index finger, which plays a very important part in the use of the throwing-stick.
8. Spear shaft groove, in which the shaft of the weapon lies, as an arrow or bolt in the groove of a bow-gun.
9. Hook or spur, provision for seizing the butt end of the weapon while it is being launched. These may be ridges left in the wood by excavation, or pieces of wood, bone, ivory, &c., inserted. The size and shape of this part, and the manner of insertion, are also worthy of notice.
10. Edges: this feature is allied to the form and not to the function of the implement.
11. Faces: upper, on which the weapon rests; lower, into which the index finger is inserted.

The figures illustrating this article are drawn to a scale indicated by inch marks in the margin, every dot on the line standing for an inch.

By the presence or absence, by the number or the shape of some of these marks or structural characteristics, the type and locality can be easily detected. The Eskimo have everywhere bows and arrows for land hunting, the former made of several pieces of bone lashed together, or of a piece of driftwood lashed and re-enforced with sinew. The arrows are of endless variety.

It should also be noticed that the kind of game and the season of the year, the shape and size of the spear accompanying the stick, and the bare or gloved hand, are all indicated by language expressed in various parts of this wonderful throwing-stick.

GREENLAND TYPE.

The Greenland throwing-stick is a long, flat trapezoid, slightly ridged along the back (Fig. 2). It has no distinct handle at the wide end, although it will be readily seen that the expanding of this part secures a firm grip. A chamfered groove on one side for the thumb, and a smaller groove on the other side for the index finger, insure the implement against slipping from the hunter's grasp. Marks 5, 6, 7 of the series on page 280 are wanting in the Greenland type. The shaft-groove, in which lies the shaft of the great harpoon, is wide, deep, and rounded at the bottom. There is no hook, as in all the other types, to fit the end of the harpoon shaft, but in its stead are two holes, one in the front end of the shaft-groove, between the thumb-groove and the finger-groove, with an ivory eyelet or grommet for a lining, the other at the distal end of the shaft-groove, in the ivory piece which is ingeniously inserted there to form that extremity. This last-mentioned hole is not cylindrical like the one in front, but is so constructed as to allow the shaft-peg to slide off easily. These holes exactly fit two ivory pegs projecting from the harpoon shaft. When the hunter has taken his throwing-stick in his hand he lays his harpoon shaft upon it so that the pegs will fall in the two little holes of the stick. By a sudden jerk of his hand the harpoon is thrown forward and released, the pegs drawing out of the holes in the stick. At the front end of the throwing-stick a narrow piece of ivory is pegged to prevent splitting. As before intimated, this type of throwing-stick is radically different from all others in its adjustment to the pegs on the heavy harpoon. In all other examples in the world the hook or spur is on the stick and not on the weapon.

UNGAVA TYPE.

One specimen from Fort Chimo in this region, southeast of Hudson Bay, kindly lent by Mr. Lucien Turner, is very interesting, having little relation with that from Greenland (which is so near geographically), and connecting itself with all the other types as far as Kadiak, in

Alaska (Fig. 3). The outline of the implement is quite elaborate and symmetrical, resembling at the hook end a fiddle-head, and widening continuously by lateral and facial curves to the front, where it is thin and flat. A slight rounded notch for the thumb, and a longer chamfer for three fingers, form the handle. Marks 5 and 6 are wanting. The cavity for the index finger extends quite through the implement, as it does in all cases where it is on the side of the harpoon-shaft groove, and not directly under it. The shaft groove is shallow, and the hook at the lower extremity is formed by a piece of ivory inserted in a parallel groove in the fiddle-head and fastened with pegs. It is as though a saw-cut one-eighth inch wide had been made longitudinally through the fiddle-head and one-half inch beyond, and the space had been filled with a plate of ivory pared down flush with the wood all round, excepting at the projection left to form the hook or spur for the harpoon shaft. This peg or spur fits in a small hole in the butt of the harpoon or spear shaft and serves to keep the weapon in its place until it is launched from the hand. The Ungava spear is heavier than that of the western Eskimo, hence the stick and its spur are proportionately larger. It is well to observe carefully the purport of the spur. A javelin, assegai, or other weapon hurled from the hand is seized in the center of gravity. The Greenland spears have the pegs for the throwing-stick sometimes at the center of gravity, sometimes at the butt end. In all other uses of the throwing-stick the point of support is behind the center of gravity, and if the weapon is not fastened in its groove in cannot be hurled. This fastening is accomplished by the backward leaning of the peg in the Greenland example, and by the spur on the distal end of the throwing-stick in all other cases.

CUMBERLAND GULF TYPE.

The Cumberland Gulf type is the clumsiest throwing stick in the Museum, and Dr. Franz Boas recognizes it as a faithful sample of those in use throughout Baffin Land (Fig. 4).

In general style it resembles Mr. Turner's specimens from Ungava; but every part is coarser and heavier. It is made of oak, probably obtained from a whaling vessel. Instead of the fiddle-head at the distal end we have a declined and thickened prolongation of the stick without ornament. There is no distinct handle, but provision is made for the thumb by a deep, sloping groove; for the index-finger by a perforation, and for the other three fingers by separate grooves. These give a splendid grip for the hunter, but the extraordinary width of the handle is certainly a disadvantage. There are two longitudinal grooves on the upper face; the principal one is squared to receive the rectangular shaft of the bird spear; the other is chipped out for the tips of the fingers, which do not reach across to the harpoon shaft, owing to the clumsy width of the throwing-stick. In this example, the hook for the end of the bird-spear shaft is the canine tooth of some animal driven into the wood at the distal end of the long-shaft groove.

FURY AND HECLA STRAITS TYPE.

In Parry's Second Voyage (p. 508) is described a throwing-stick of Igloolik, 18 inches long, grooved for the shaft of the bird-spear, and having a spike for the hole of the shaft, and a groove for the thumb and for the fingers. The index-finger hole is not mentioned, but more than probably it existed, since it is nowhere else wanting between Ungava and Cape Romanzoff in Alaska. This form, if properly described by Parry, is between the Ungava and the Cumberland Gulf specimen, having no kinship with the throwing-stick of Greenland. The National Museum should possess an example of throwing-stick from the Fury and Hecla Straits.

ANDERSON RIVER TYPE.

The Anderson River throwing-stick (and we should include the Mackenzie River district) is a very primitive affair in the National Museum, being only a tapering flat stick of hard wood (Fig. 5). Marks 2, 3, 4, 5, and 6 are wanting. The index-finger cavity is large and eccentric and furnishes a firm hold. The shaft-groove is a rambling shallow slit, not over half an inch wide. There is no hook or spur of foreign material inserted for the spear end; but simply an excavation of the hard wood which furnishes an edge to catch a notch in the end of the dart. Only one specimen has been collected from this area for the National Museum; therefore it is unsafe to make it typical, but the form is so unique that it is well to notice that the throwing-stick in Eskimoland has its simplest form in the center and not in the extremities of its whole area. It is as yet unsafe to speculate concerning the origin of this implement. A rude form is as likely to be a degenerate son as to be the relic of a barbaric ancestry. Among the theories of origin respecting the Eskimo, that which claims for them a more southern habitat long ago is of great force. If, following retreating ice, they first struck the frozen ocean at the mouth of Mackenzie's River and then invented the kyak and the throwing-stick, thence we may follow both of these in two directions as they depart from a single source.

POINT BARROW TYPE.

Through the kindness of Mr. John Murdoch, I have examined a number from this locality, all alike, collected in the expedition of Lieutenant Ray, U. S. A. (Fig. 6). They are all of soft wood, and in general outline they resemble a tall amphora, bisected, or with a slice cut out of the middle longitudinally. There is a distinct "razor-strop" handle, while in those previously described the handle is scarcely distinct from the body. Marks 3, 4, 5, and 6 are wanting. The index-finger hole is very large and eccentric, forming the handle of the "amphora." The groove for the harpoon or spear-shaft commences opposite the index-finger cavity as a shallow depression, and deepens gradually to its other extremity, where the hook for the spear-shaft is formed by an ivory peg. This form is structurally almost the same as the Anderson River type, only it is much better finished.

KOTZEBUE SOUND TYPE.

The Kotzebue Sound type is an elongated truncated pyramid, or obelisk, fluted on all sides (Fig. 7). The handle is in the spiral shape so frequent in Eskimo skin-scrapers from Norton Sound and vicinity, and exactly fits the thumb and the last three fingers. Marks 5 and 6 are wanting. The index cavity is a *cul de sac*, into which the forefinger is to be hooked when the implement is in use. Especial attention is called to this characteristic because it occurs here for the first time and will not be seen again after we pass Cape Vancouver. From Ungava to Point Barrow the index-finger hole is eccentric and the finger passes quite through the implement and to the right of the harpoon or spear-shaft. In the Kotzebue type the index finger cavity is subjacent to the spear-shaft groove, consequently the forefinger would be wounded or at least in the way by passing through the stick. The spear or harpoon-shaft groove is wide and shallow and passes immediately over the index cavity. The hook is of ivory and stands up above the wood. It needs only to be mentioned that this type, as well as those with eccentric forefinger perforations are used with the naked hand.

In the quarto volume of Beechey's Voyage, page 324, is mentioned a throwing-stick from Eschscholtz Bay, with a hole for the forefinger and a notch for the thumb, the spear being placed in the groove and embraced by the middle finger and the thumb. This last assertion is very important. When I first began to examine a large number of the implements, I could not explain the cavities for the finger-tips until this note suggested that the shaft rides outside of and not under the fingers. To test the matter I had a throwing-stick made to fit my hand, and found that the spear could get no start if clamped close to the throwing-stick by all the fingers; but if allowed to rest on the back of the fingers or a part of them, and it is held fast by the thumb and middle finger, it had just that small rise which gave it a start from the propelling instrument.

In the national collection is a specimen marked Russian America, collected by Commodore John Rodgers, resembling in many respects the Kotzebue Sound type. The handle is of the same razor-strop shape, but on the upper side are three deep depressions for the finger-tips. In several of the objects already described provision is made for the tips of the last three fingers by means of a gutter or slight indentations. But in no other examples is there such pronounced separation of the fingers. In very many of the Norton Sound skin-dressers, composed of a stone blade and ivory handle, the fingers are separated in exactly the same manner. These skin-dressers are from the area just south of Kotzebue Sound. The back of the Rodgers specimen is ornamented in its lower half by means of grooves. In its upper half are represented the legs and feet of some animal carved out in a graceful manner. The index-finger cavity is central and is seen on the upper side by a very slight rectangular perforation, which, however, does not admit the extrusion of any part of the index-finger. The upper surface is formed by two inclined planes meeting in the center. Along this central ridge is excavated the groove for the spear-shaft, deep at its lower end and quite running out at its upper extremity. The hook for the end of the harpoon-shaft in this specimen resembles that seen on the throwing-sticks of the region south of Cape Vancouver. The whole execution of this specimen is so much superior to that of any other in the Museum and the material so different as to create the suspicion that it was made by a white man, with steel tools (Fig 8).

EASTERN SIBERIAN TYPE.

The National Museum has no throwing-stick from this region, but Nordenskjöld figures one in the Voyage of Vega (p. 477, Fig. 5), which is as simple as the one from Anderson River, excepting that the former has a hook of ivory, while the latter has a mere excavation to receive the cavity on the end of the weapon. Nordenskjöld's bird-spear accompanying the stick has a bulb or enlargement of the shaft at the point opposite the handle of the throwing-stick, which is new to the collection of the National Museum. Indeed, a systematic study should now be made of the Siberian throwing-sticks to decide concerning the commercial relationships if not the consanguinities of the people of that region.

PORT CLARENCE AND CAPE NOME TYPE.

The specimens from this area are more or less spatulate in form, but very irregular, with the handle varying from that of the razor-strop to the spiral, twisted form of the Eskimo skin-scraper (Fig. 9). On the whole, these implements are quite similar to the next group. A section across the middle of the implement would be trapezoidal with incurved sides. In two of the specimens not figured these curved sides are brought upward until they join the upper surface, making a graceful ornament. The handles are not symmetrical, the sides for the thumb being shaved out so as to fit the muscles conveniently. Places for the fingers are provided thus: There is an index-finger cavity quite through the stick indeed, but the index-finger catches in the interior of the wood and does not pass through as in the eastern Arctic types. The middle finger rests against an ivory or wooden peg. This is the first appearance of this feature. It will be noted after this on all the throwing-sticks as the most prominent feature until we come to Kadiak, but the Unalashkans do not use it on their throwing-sticks. Cavities for the three last finger-tips are not always present, and the hooks at the distal ends for the extremities ofthe weapons are very large plugs of wood or ivory and have beveled edges rather than points for the reception of the butt end of the weapon to be thrown.

NORTON SOUND TYPES.

These types extend from Cape Darby around to Cape Dyer, including part of Kaviagmut, the Mahlemut, the Unaligmut, and the Ekogmut area of Dall, and extending up the Yukon River as far as the Eskimo, who use this weapon. The characteristics are the same as those of the last named area, excepting that in many specimens there are two finger-pegs instead of one, the first peg inclosing the middle finger, the second the ring-finger and the little finger (Figs. 10–13). A single specimen collected by Lucien Turner at Saint Michael's has no index cavity, the forefinger resting on the first peg and the other three fingers passing between this and the outer peg (Fig. 14). Another specimen of Nelson's, marked Sabotinsky, has the index-finger cavity and one finger-peg. The finger-tip cavity on the upper surface of the handle forms the figure of a water-bird, in which the heart is connected with the mouth by a curved line, just as in the pictography of the more southern Indians.

The Yukon River Eskimo use a throwing-stick quite similar to the Norton Sound type. The characteristics are very pronounced. Thumb-groove deep, index-finger cavity so long as to include the first joint. The hook for the spear-end formed by the edge of a plug of hard wood. The middle finger is separated by a deep groove and peg. The ring and little finger are inclosed by the peg and a sharp projection at the upper end of the handle.

NUNIVAK ISLAND AND CAPE VANCOUVER TYPE.

In this region a great change comes over the throwing-stick, just as though it had been stopped by Cape Romanzoff, or new game had called for modification, or a mixing of new peoples had modified their tools (Figs. 15–17). The index-finger cavity and the hole for the index finger are here dropped entirely, after extending from Greenland uninterruptedly to Cape Romanzoff. The handle is conspicuously wide, while the body of the implement is very slender and light. The thumb-groove is usually chamfered out very thoroughly so as to fit the flexor muscle conveniently. There are frequently finger-grooves and finger-tip cavities in addition to the pegs. The cavity for the index finger having disappeared, provision is made for that important part of the hand by a separate peg and groove. The middle finger is also pegged off, and the last two fingers have to shift for themselves. The hook for the shaft of the weapon has a fine point like a little bead, the whole implément being adapted to the light seal-harpoon darts. Mr. Dall collected a large number of two-pegged sticks from Nunivak Island and four three-pegged sticks labeled the same. Mr. Nelson also collected four three-pegged sticks, but labels them Kushunuk, Cape Vancouver, on the mainland opposite Nunivak (Fig. 17). In these three-pegged sticks the ring-finger and the little finger are inclosed together. This should be compared with Mr. Turner's Saint Michael specimen, in which the last three fingers are inclosed together (Fig. 14). It remains to be seen and is worthy of investigation whether crossing a narrow channel would add a peg to the throwing-stick. One of these Nunivak specimens is left-handed.

BRISTOL BAY TYPE.

The throwing-stick from Bristol Bay resembles in general characteristics those from Nunivak Island and Cape Vancouver. In outline it has the shape of the broadsword. Its cross-section is bayonet-shaped. It has no distinct handle beyond a slight projection from the end. The thumb-groove is shallow and chamfered on the lower side to fit exactly. There is a long, continuous notch for the four fingers, in which the index finger and the middle finger are set off by pegs. There is a depression, more or less profound, to receive the tips of the fingers. The groove for the harpoon or spear-shaft is at the lower extremity and runs out entirely near the index finger. The ivory plug at its lower extremity is beveled to receive a notch in the end of the spear or harpoon shaft (Figs. 18–19).

A freshly-made implement, looking as if cut out by machinery, resembling closely those just described, is labeled Kadiak. The constant traffic between Bristol Bay and Kadiak, across the Alaskan peninsula, may account for the great similarity of these implements. Furthermore, since the natives in this region and southward have been engaged for more than a century in fur-sealing for the whites, there is not the slightest doubt that implements made by whites have been introduced and slightly modified by the wearer to fit his hand.

KADIAK OR UNALASHKA TYPE.

In the National Museum are four throwing-sticks, one of them left-handed, exactly alike—two of them marked Kadiak and two Unalashka (Figs. 20–22). They return to the more primitive type of the area from Kotzebue Sound to Greenland, indicating that the implement culminated in Norton Sound. In outline this southern form is thin and straight-sided, and those in possession are all of hard wood. The back is carved in ridges to fit the palm of the hand and muscles of the thumb. There is no thumb-groove, the eccentric index-finger hole of the Northern and Eastern Eskimo is present in place of the central cavity of the area from Kotzebue Sound to Cape Vancouver, and there is a slight groove for the middle finger. Marks 5 and 6 are wanting. The shaft-groove is very slight, even at its lower extremity, and runs out in a few inches toward the handle. The hook for the end of the weapon resembles that of Nunivak, but is more rounded at the point. Of the Eskimo of Prince William Sound, the extreme southern area of the Eskimo on the Pacific, Captain Cook says, in the narrative of his last voyage:

"Their longer darts are thrown by means of a piece of wood about a foot long, with a small groove in the middle which receives the dart. At the bottom is a hole for the reception of one finger, which enables them to grasp the piece of wood much firmer and to throw with greater force." Captain Cook's implement corresponds exactly to the specimens just described and renders it probable that this thin, parallel-sided, shallow-grooved throwing-stick, with index-finger hole placed at one side of the spear-shaft groove, extended all along the southern border of Eskimoland as far as the Aleuts of Unalashka and Attoo. In addition to the information furnished by the specimens in hand, Dr. Stejneger describes a similar stick in use in the island of Attoo. On the contrary, Mr. Elliott assures me that Aleutian fur-sealers of Pribylov Island use throwing-sticks precisely similar to those of Norton Sound and Nunivak.

This list might be extended further by reference to authorities, but that is from the purpose of this article and the series of ethnological papers commenced in this volume. The most perfect throwing-stick of all is that of the Mahlemut, in Norton Sound, in which are present the handle, thumb-groove, finger-grooves, and pegs, cavities for the finger-tips, index finger cavity, shaft-groove, and hook for the harpoon. In short, all the characteristics present on the rest are combined here.

Classifications of these implements may be varied according to the organ selected. As to the hook for the attachment of the weapon, in Greenland this is on the shaft, in all other parts of the world it is on the throwing-stick. As to the index finger, there is for its reception, from Point Barrow to Greenland, an eccentric hole quite through which the finger passes. From Kotzebue Sound to Norton Sound there is a central pocket on the back of the weapon, directly under the groove, for the shaft of the weapon to receive the index finger. From Cape Vancouver to Bristol Bay an ivory or wooden peg serves this purpose. At Kadiak and Unalashka the eccentric index-finger hole returns.

It is more than probable that further investigation will destroy some of the types herein enumerated or merge two more of them into one; but it will not destroy the fact that in changing from one environment to another the hyperboreans were driven to modify their throwing-stick.

A still more interesting inquiry is that concerning the origin of the implement. It is hardly to be supposed that the simplest type, that of Anderson River, was invented at once in its present form, for the Australian form is ruder still, having neither hole for the index finger nor groove for the weapon shaft. When we recall that the chief benefit conferred by the throwing-stick is the ability to grasp firmly and launch truly a greasy weapon from a cold hand, we naturally ask, have the Eskimo any other device for the same purpose? They have. On the shaft of the light-seal harpoon, thrown without the stick, and on the heavy, ivory-weighted walrus-harpoon-shaft an ivory hand-rest is lashed just behind the center of gravity. This little object is often beautifully carved and prevents effectually the hand from slipping on the shaft, even with the greatest lunge of the hunter. From this object to the throwing-stick the way may be long and crooked, or there may be no way at all. So far as the National Museum is concerned there is nothing to guide us over this waste of ignorance.

THROWING-STICKS IN THE U. S. NATIONAL MUSEUM.

No.	Locality.	Collector.
32995	Norton's Sound, Alaska	E. W. Nelson.
30013	Cumberland Gulf	W. A. Mintzner, U. S. N.
33942	Norton's Sound, Alaska	E. W. Nelson.
33897	do	Do.
33960	do	Do.
24336	Saint Michael's Sound, Alaska	Lucien M. Turner.
24337	do	Do.
24338	do	Do.
46052	Port Clarence, Alaska	W. H. Dall.
40053	do	Do.
49036	Rasbonisky, L. Yukon	E. W. Nelson.
38849	Yukon River	Do.
88605	do	Do.
36014	Kushunuk, Sabotnisky, Alaska	Do.
36018	Kuskunuk, Alaska	Do.
49001	Sabotnisky, Alaska	Do.
49002	do	Do.
73327	Unalashka	Catlin.
2267	Anderson River	R. Kennicott.
90467	Ugashak	William J. Fisher.
44392	Cape Nome, Alaska	E. W. Nelson.
72519	Cook's Inlet	William J. Fisher.
16242	Nunivak Island, Alaska	W. H. Dall.
16238	do	Do.
74126	Holsteinberg, Greenland	George Merchant, jr.
12981	Unalashka	W. H. Dall.
89901	Point Barrow, Alaska	Lieut. P. H. Ray.
38669	Chalitmut	E. W. Nelson.
24335	Saint Michael's, Norton's Sound, Alaska	Lucien M. Turner.
33914	do	E. W. Nelson.
7933	Kadiak Island, Alaska	Dr. T. T. Minor, U. S. R. M.
36013	Sabotnisky, Alaska	E. W. Nelson.
72398	Bristol Bay, Alaska	Charles L. McKay.
16244	Nunivak Island, Alaska	W. H. Dall.
11346	Bristol Bay, Alaska	Vincent Colyer,
16235	Kotzebue Sound, Alaska	E. P. Herenden.
15641	Nunivak, Alaska	W. H. Dall.
16237	do	Do.
10239	do	Do.
16076	Unalashka, Aleutian Islands	Sylvanus Bailey.
15647	Nunivak, Alaska	W. H. Dall.
15645	do	Do.
16236	do	Do.
15042	do	Do.
15646	do	Do.

PLATE I.

(Mason. Throwing-sticks.)

FIG. 1. Eskimo launching a seal harpoon by means of the throwing-stick. Mr. John Murdoch states that the hand is held much lower by the Point Barrow Eskimo, the harpoon resting as low as the shoulder, and that the movement of throwing the harpoon is quick, as in casting a fly in fishing.

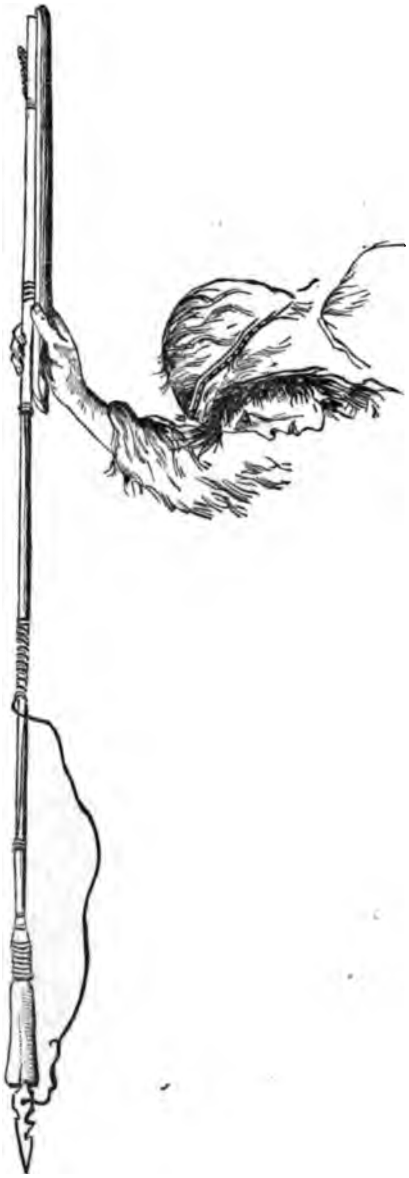


FIG. 1. Eskimo using the throwing-stick.

PLATE II.

(Mason. Throwing-sticks.)

FIG. 2. Greenland type of throwing-stick. The specific characteristics are the broad form; the scanty grooves for thumb and fingers; the absence of pegs, separate finger grooves, or index perforation; but the most noteworthy are the two grommets or eyelets to fit ivory pegs on the harpoon-shaft. The peculiar method of strengthening the ends with ivory pieces should also be noted. From Holsteinburg, Greenland, 1884. Catalogue number, 74126.

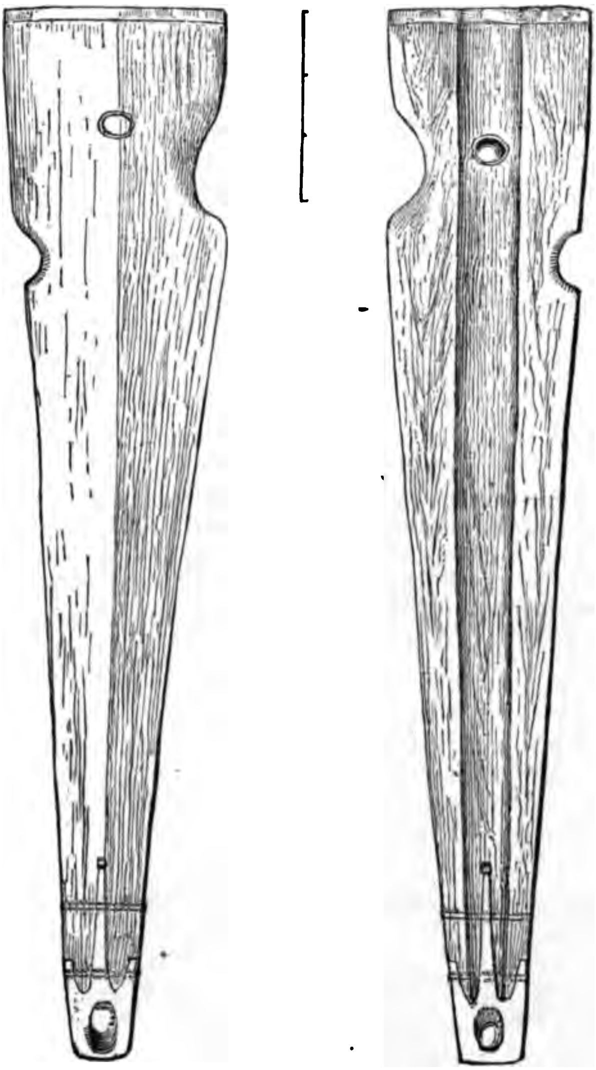


FIG. 2. Greenland throwing-stick, back and front.

PLATE IV.

(Mason. Throwing-sticks.)

FIG. 4. Cumberland Gulf type of throwing-stick. The specific marks are the broad clumsy form, the separate provision for the thumb and each finger, the bent lower extremity, and the broad furrow for the bird-spear. Accidental marks are the mending of the handle, the material of the stick, and the canine tooth for the spur at the bottom of the square groove. Collected in Cumberland Gulf, by W. A. Mintzer, in 1876. Museum number, 30013.

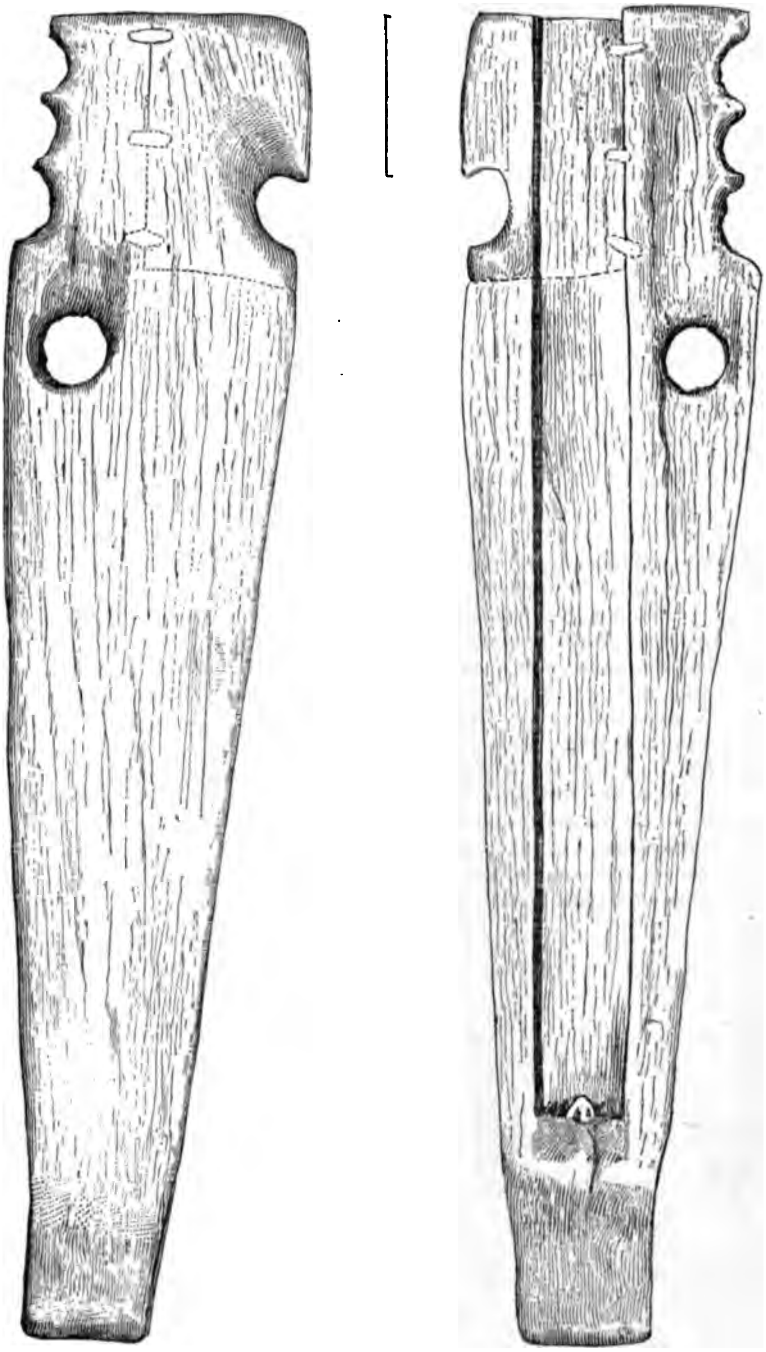


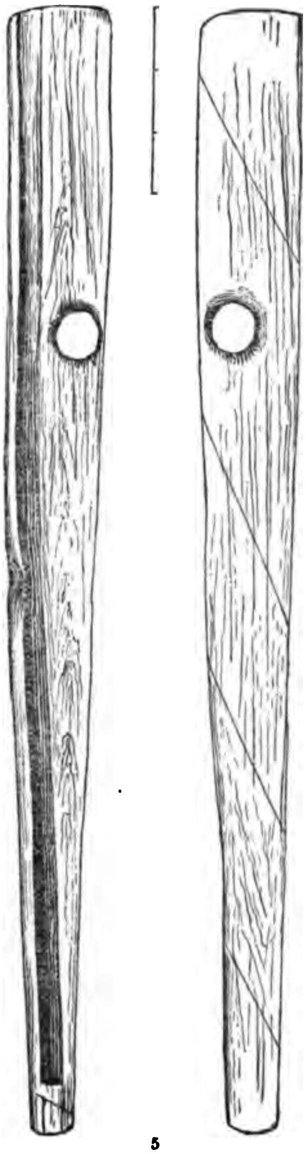
FIG. 4. Cumberland Gulf throwing-stick, back and front.

PLATE V.

(Mason. Throwing-sticks.)

FIG. 5. Anderson River type. The specific marks are the extreme plainness of form, the lack of accommodations for the thumb and fingers, excepting the eccentric index-finger hole, the poor groove for the harpoon-shaft, and the absence of a hook or spur at the bottom of this groove. The accidental marks are cuts running diagonally across the back. In another specimen seen from the same locality the shaft groove is squared after the manner of the Cumberland Gulf type. Collected at the mouth of Anderson River, by R. Kennicott, in 1866. Museum number, 2267.

FIG. 6. Point Barrow type. The specific marks are the distinct handle without finger grooves, the very eccentric index-finger hole, the method of inserting the spur for the shaft, and the harpoon-shaft groove very shallow above and deep below. In the specimens shown by Mr. Murdoch there is great uniformity of shape. Collected at Point Barrow, by Lieut. P. H. Ray, in 1883. Museum number, 89902.



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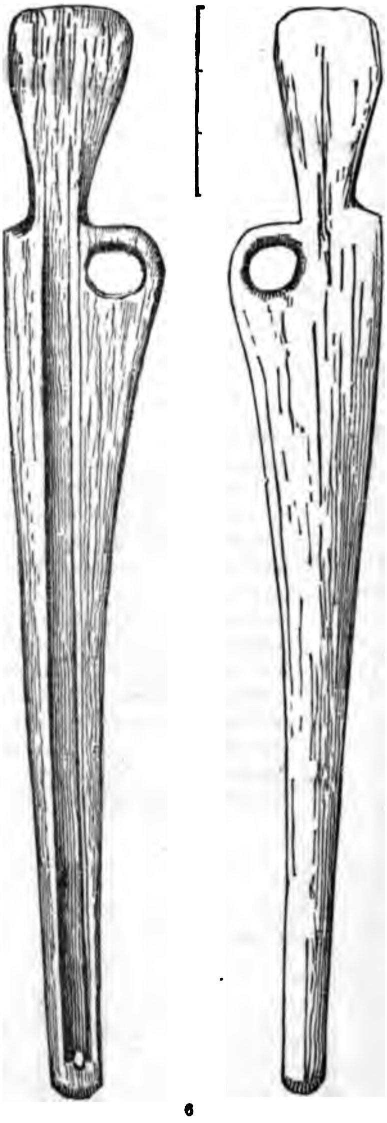

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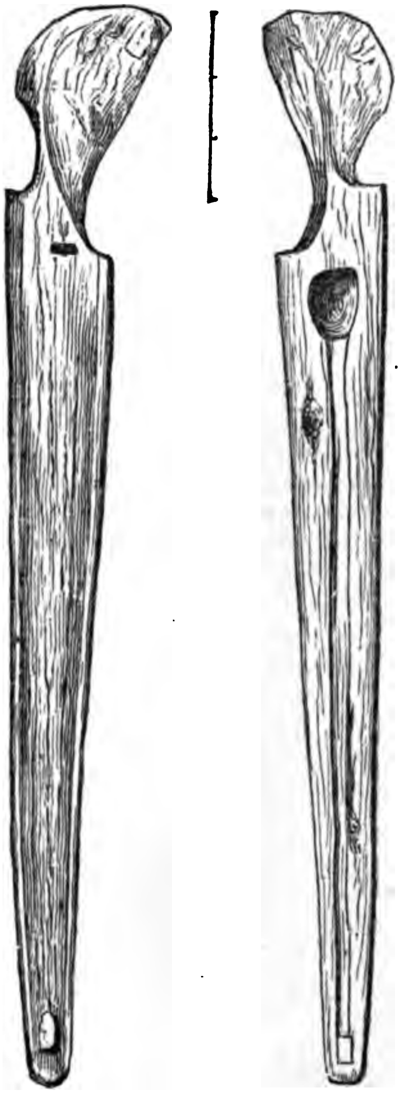
FIG. 5. Anderson River throwing-stick, front and back.
FIG. 6. Point Barrow throwing-stick, front and back.

PLATE VI.

(Mason. Throwing-sticks.)

Fig. 7. Kotzebue Sound type. The specific marks are the twisted handle, the broad shallow shaft groove, and, notably, the pocket for the index-finger tip-visible on the lower side, but nearly absent from the upper side, and lying directly under the shaft groove. In the examples before noted all the holes for the index finger are to one side of this shaft groove. Collected in Kotzebue Sound, by E. P. Herendeen, in 1874. Museum number, 16235.

Fig. 8. The Rodgers type, so called because the locality is doubtful. In specific characters it resembles Fig. 7. The differences are the three cavities for finger tips in the handle, the shaft groove very shallow and running out before reaching the index-finger cavity, and the delicate hook for the spear shaft resembling those farther south. Since writing this paper two throwing-sticks from Sitka have been seen in many respects resembling this form, but covered all over their surfaces with characteristic Thlinkit mythological figures, and having iron hooks at the lower end of the shaft groove. Collected by Commodore John Rodgers, in 1867. Museum number, 2533.



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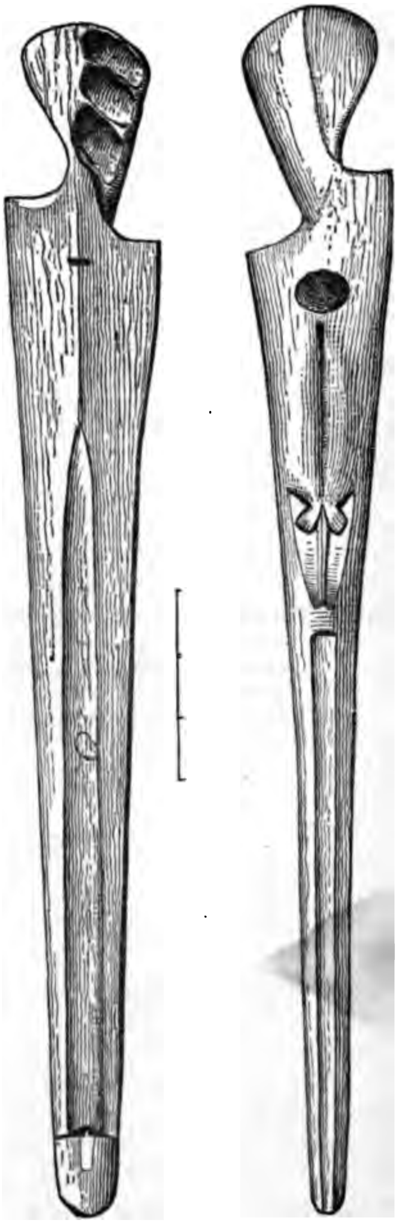

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FIG. 7. Kotzebue Sound throwing-stick, front and back.
FIG. 8. The Commodore Rodgers throwing-stick, front and back.

PLATE VII.

(Mason. Throwing-sticks.)

FIG. 9. The Port Clarence and Cape Nome type. The notable characteristics are the occurrence of an ivory peg in the handle for the middle finger, the very small size of the handle, and the central index-finger pocket central in position but quite piercing the stick. Collected by E. W. Nelson, at Cape Nome, in 1880. Museum number, 44392.

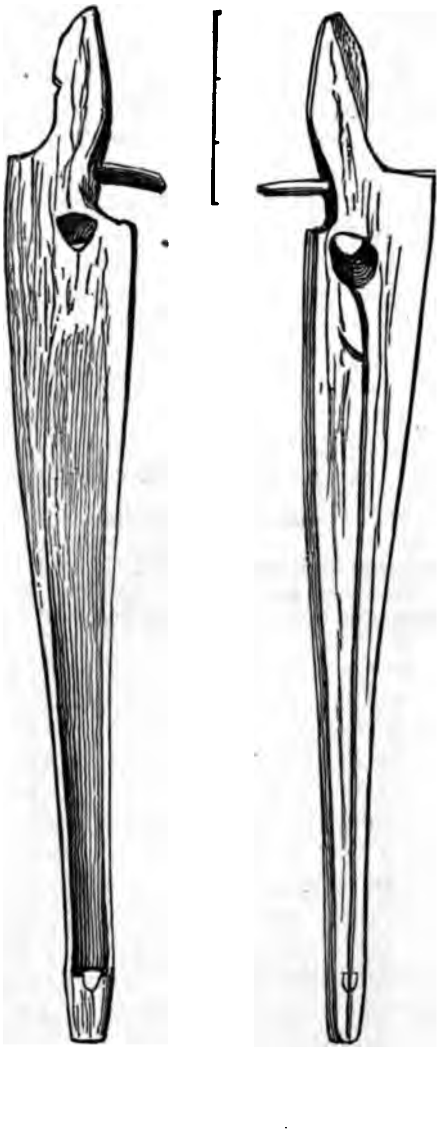


FIG. 9. Port Clarence and Cape Nome throwing-stick, front and back.

PLATE VIII.

(Mason. Throwing-sticks.)

FIG. 10. Norton Sound type, single-pegged variety. Except in the better finish, this type resembles the one last described. Collected by L. M. Turner, at Saint Michael's Island, in 1876. Museum number, 24338

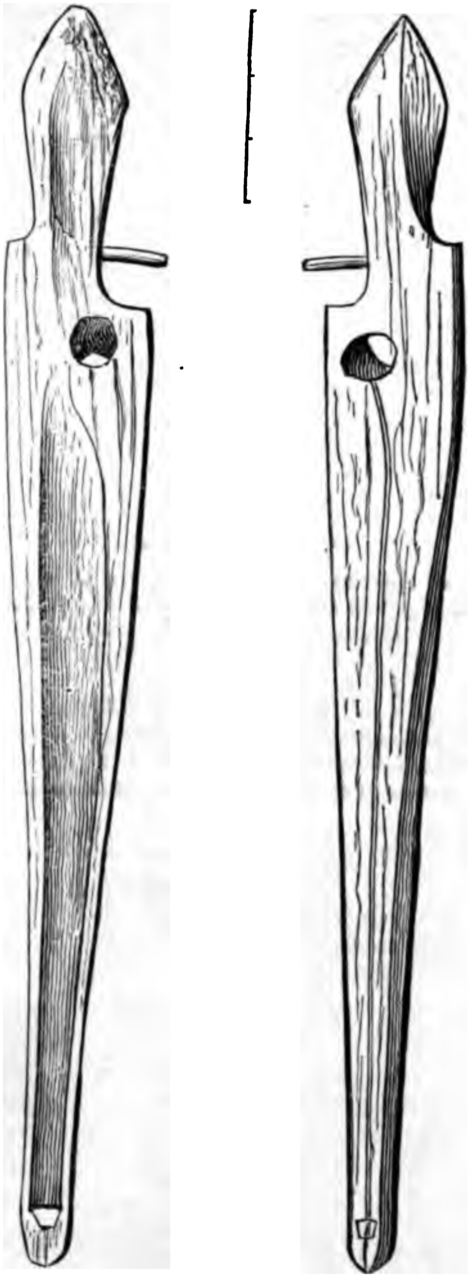


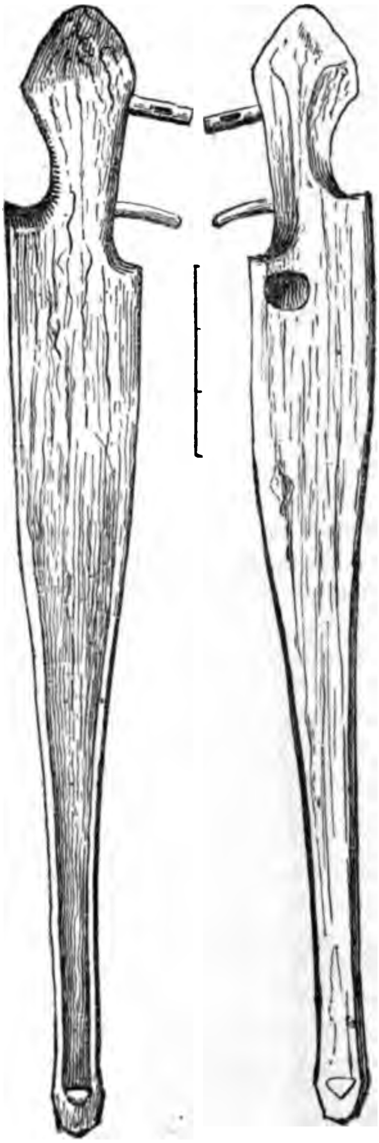
Fig. 10. Norton Sound throwing-stick, front and back.

PLATE IX.

(Mason. Throwing-sticks.)

FIG. 11. Norton Sound type, two-pegged variety. In all respects, excepting the number of pegs, this resembles Figs. 9 and 10. In all of them the peg at the bottom of the groove is very clumsy. Collected in Norton Sound, by E. W. Nelson, in 1878. Museum number, 32995.

FIG. 12. Throwing-stick from Sabotnisky, on the Lower Yukon. It belongs to the Norton Sound type. The cavity on the upper side of the handle for the finger-tips is remarkable for the carving of a bird resembling figures seen on objects made by the Western Indians of the United States. Collected by E. W. Nelson, at Sabotnisky, in 1879. Museum number, 36013.



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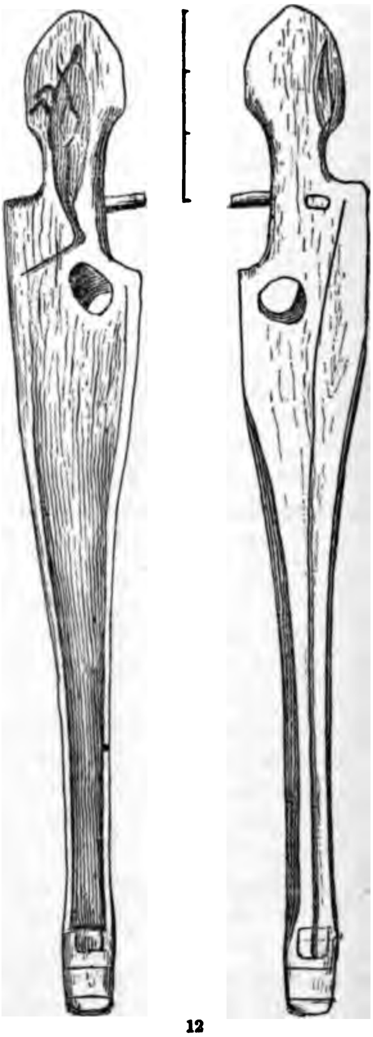

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FIG. 11. Norton Sound throwing-stick, front and back.
FIG. 12. Sabotnisky throwing-stick, front and back.

PLATE X.

(Mason. Throwing-sticks.)

Fig. 13. Specimen from Yukon River, belonging to the Northern Sound one-pegged variety. Collected by E. W. Nelson, in 1879. Museum number, 38849.

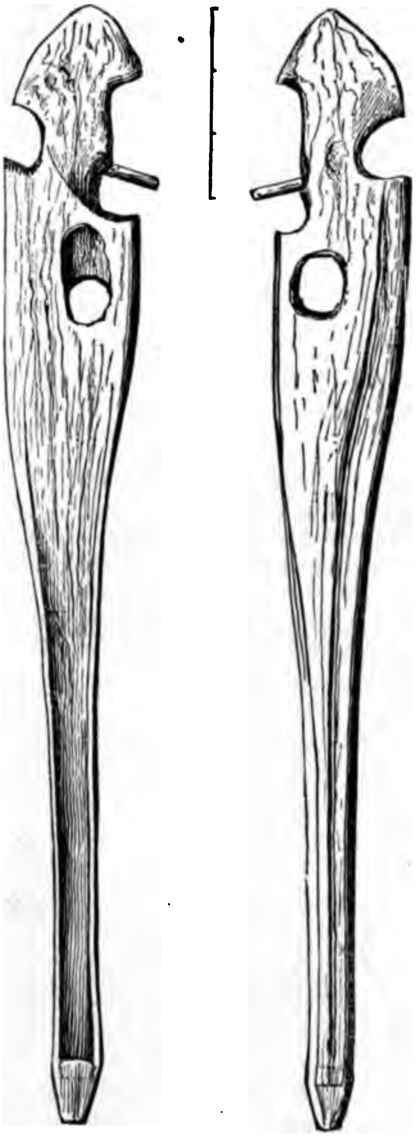


FIG. 13. Yukon River throwing-stick, front and back.

PLATE XI.

(Mason. Throwing-sticks.)

FIG. 14. Throwing-stick from Saint Michael's. This specimen is very noteworthy on account of the absence of the index-finger pocket, a mark characteristic of the Vancouver type, Fig. 17. If the middle peg of the Vancouver example were removed the resemblance would be close, but the clumsy spur at the bottom of the shaft groove is Norton Sound rather than Nunivak. Collected by Lucien M. Turner, at Saint Michael's, in 1876. Museum number, 24335.

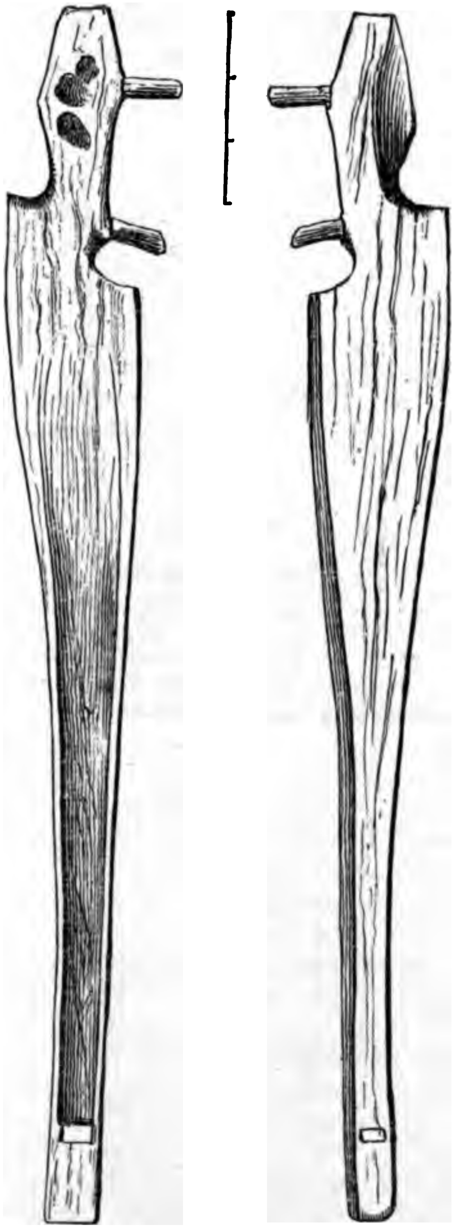


FIG. 14. Saint Michael's throwing-stick, front and back.

PLATE XII.

(Mason. Throwing-sticks.)

FIG. 15. Nunivak type. The characteristic marks are the absence of any cavity for the index finger, the nicely-fitting handle, the disposition of the finger-pegs, and the delicate point on the ivory spur at the bottom of the shaft groove. Collected by W. H. Dall, at Nunivak Island, in 1874. Museum number, 16239. (This specimen is left-handed.)

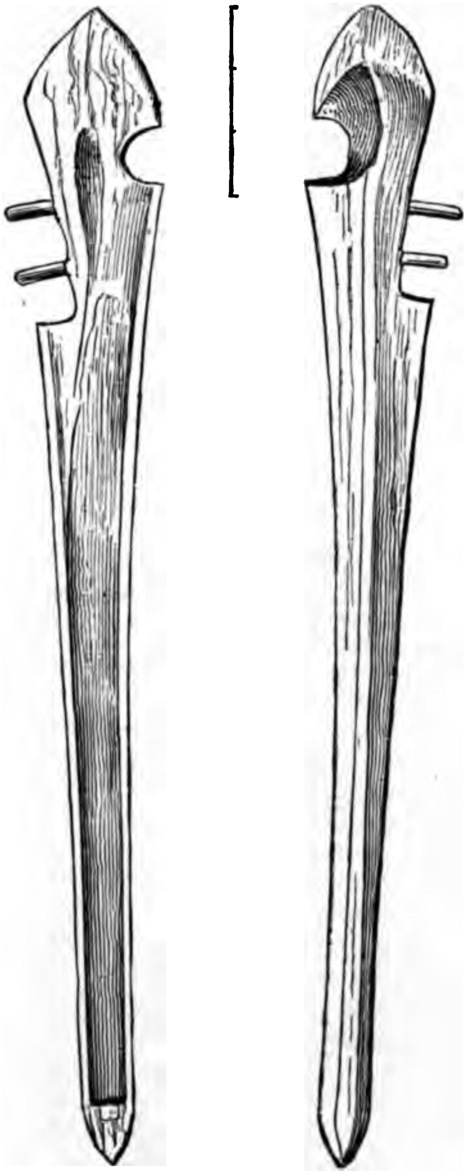


FIG. 15. Nunivak Island throwing-stick, front and back, left-handed.

PLATE XIII.

(Mason. Throwing-sticks.)

FIG. 16. Specimen from Nunivak, right-handed. The cuts on the front and back are noteworthy. Collected by W. H. Dall, at Nunivak Island, in 1874. Museum number, 16238.

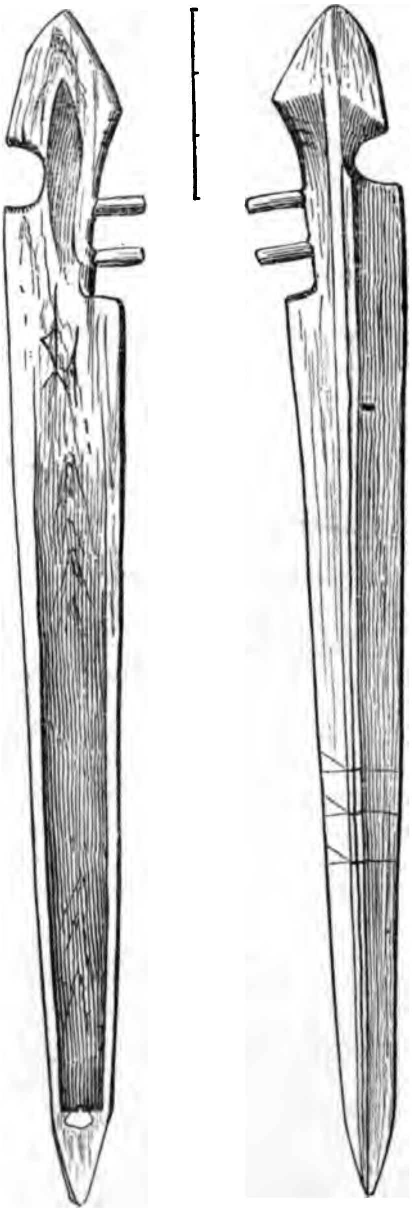


FIG. 16. Nunivak Island throwing-stick, front and back.

PLATE XIV.

(Mason. Throwing-sticks.)

FIG. 17. Specimen from Cape Vancouver. In all respects it is like those of Nunivak, excepting a peg-rest for the little finger. Collected by E. W. Nelson, at Cape Vancouver, in 1879. Museum number, 38669.

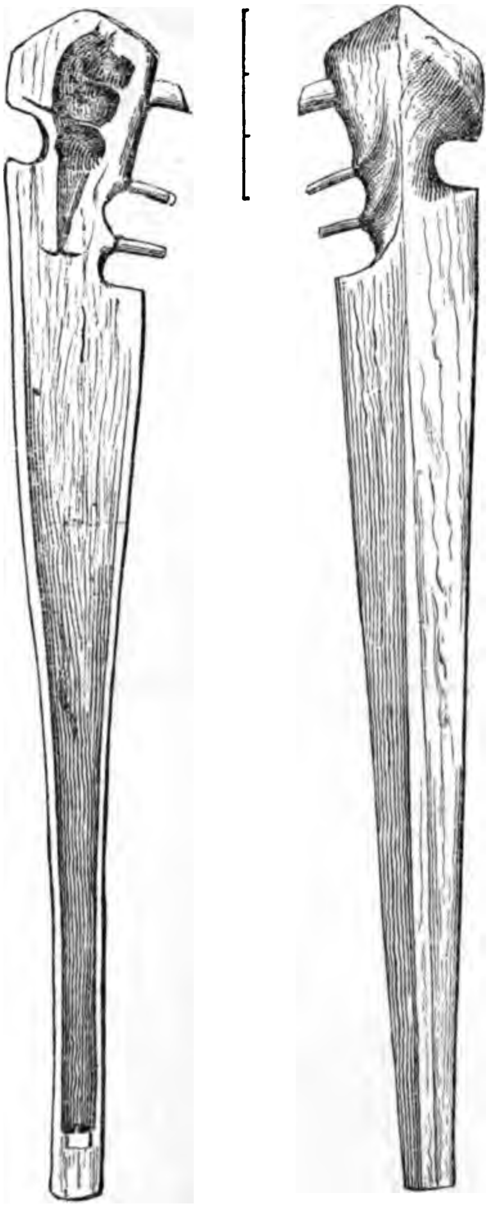
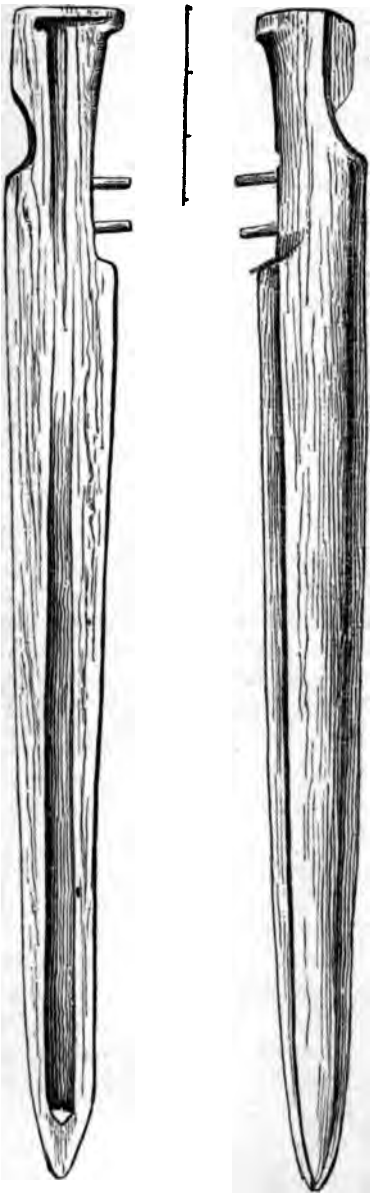


FIG. 17. Cape Vancouver throwing-stick, front and back.

PLATE XV.

(Mason. Throwing-sticks.)

FIGS. 18, 19. **Bristol Bay type.** In no essential characters do these sticks differ from those of Nunivak. The handle is smaller, and they appear to have been made with steel tools. Fig. 18 collected by C. L. McKay, at Bristol Bay, Alaska, in 1883. Museum number, 72398. Fig. 19 collected by William J. Fisher, at Kadiak, in 1884. Museum number, 90467.



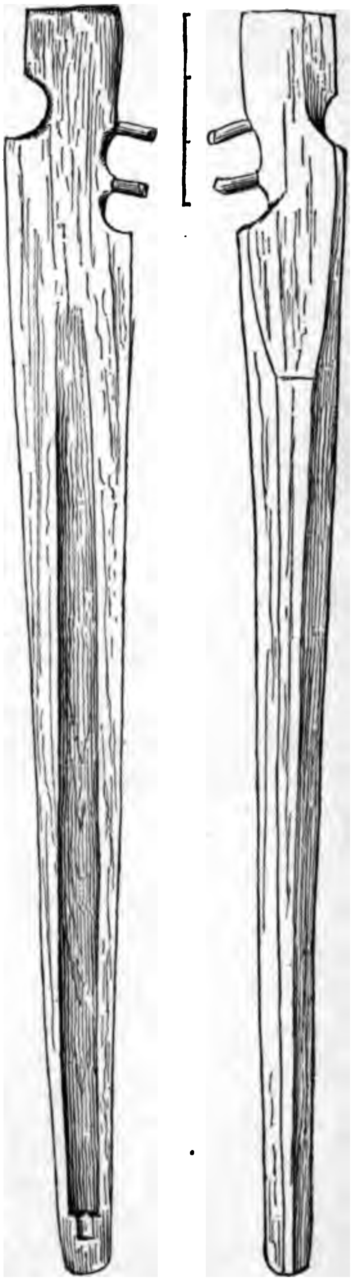


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FIG. 18. Bristol Bay throwing-stick, front and back.
FIG. 19. Bristol Bay throwing-stick, front and back.

PLATE XVI.

(Mason. Throwing-sticks.)

FIG. 20. Unalashkan throwing-stick. It would be better to call this form the Southern type. The noticeable features in all our specimens are the parallel sides, the hard material, thinness, the carving for the fingers, but above all the reappearance of the eccentric cavity for the index finger. This cavity is not a great perforation, as in the Point Barrow type, but an eccentric pocket, a compromise between the Northern cavity and that of the East. Collected by Sylvanus Bailey, at Unalashka, in 1874. Museum number, 16076.

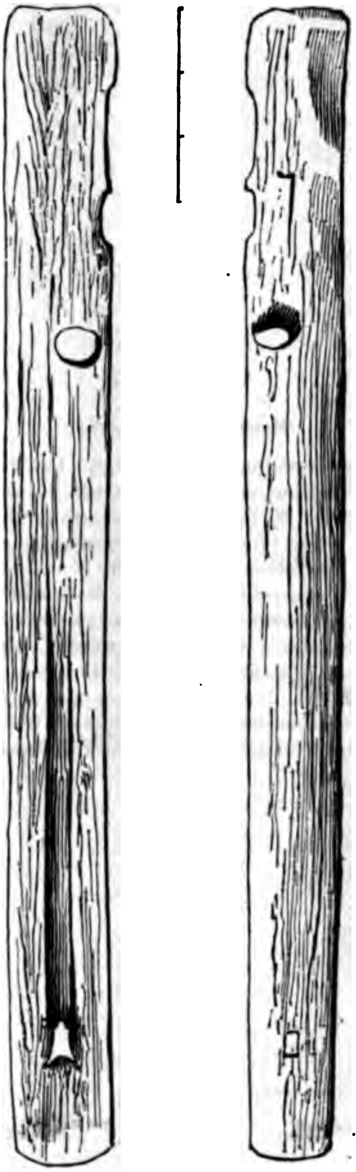
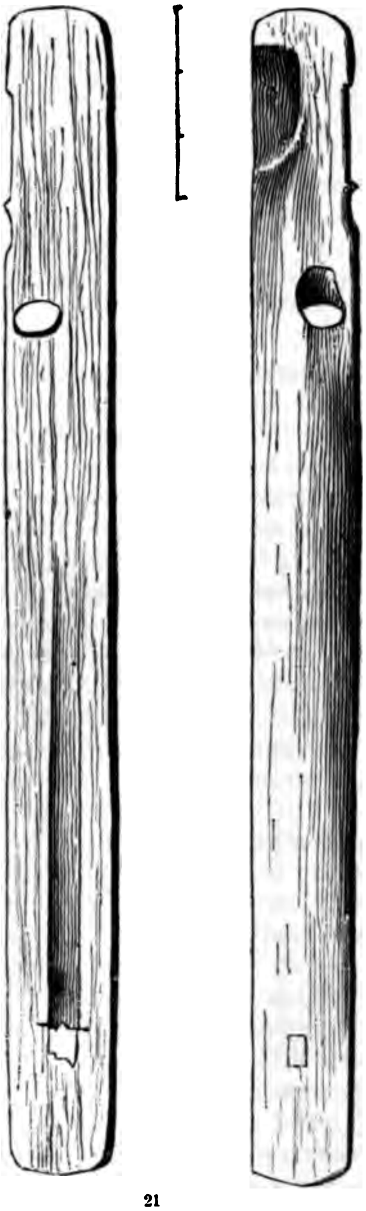


FIG. 20. Unalashkan throwing-stick, front and back.

PLATE XVII.

(Mason. Throwing-sticks.)

FIGS. 21, 22. Throwing-sticks of the Southern type. Fig. 21 is left-handed, collected by Dr. T. T. Minor, at Kadiak, in 1869. Museum number, 7933. Fig. 22 collected by W. H. Dall, at Unalashka, in 1873. Museum number, 12981. At Sitka two specimens were collected, unfortunately not figured, with the following characters laid down in the beginning of this paper: 1. Short, very narrow and deep, and carved all over with devices. 2. No handle distinct from the body. 3, 4, 5, 6. All wanting. 7. The index-finger cavity is near the center of the back, very like a thimble. Indeed this is a very striking feature. 8. The shaft groove occupies only the lower half of the upper surface. 9. The spur for the end of the weapon shaft is a long piece of iron like a knife-blade driven into the wood, with the edge toward the weapon shaft.



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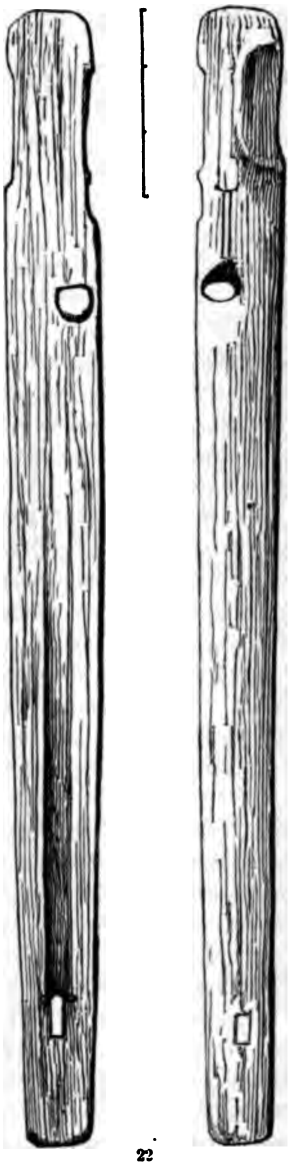

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FIG. 21. Kadiak throwing-stick, front and back, left handed.
FIG. 22. Unalashkan throwing-stick, front and back.

II.—BASKET-WORK OF THE NORTH AMERICAN ABORIGINES.

By Otis T. Mason.

> "Barbara de pictis veni *bascauda* Britannis,
> Sed me jam mavult dicere Roma suum."
>
> —Martial, xiv, 99.

The study of the minutest technique in the distribution of aboriginal arts is very necessary in making up our opinions on questions of Anthropology. The archæologist is frequently caused to halt in the reconstruction of ancient society by his ignorance of the arts of the savages around him. This is especially true of an art which had its culmination in savagery or barbarism, and which began to decline at the touch of civilization, or at least to give place to higher types of the same art. For the discussions of problems that have arisen in the past the data then in hand have been sufficient; but as the investigations of social progress become more intricate the demands for greater detail in the observation of anthropological phenomena around us is imperative.

I have lately had occasion to examine all the baskets in the National Museum, and the results of this research may not be uninteresting as a contribution to exact technology in an art which may be called *par excellence* a savage art.

In a basket there are several characteristics to be observed, which will enable us to make a classification of the objects themselves and to refer them to their several tribal manufacturers. These characteristics are the *material*, the *frame-work*, the *methods of weaving*, the *coiling or sewing*, the *decoration*, their *use*, &c.

The tool almost universally used in their manufacture is a bone awl or pricker and the makers are the women. Of the manipulation of the material previously to the weaving little is known.

In the drawings accompanying this paper the actual size of the specimens is indicated by a series of inch marks in the margin. The inches on the standard line are shown by spaces between dots. In order to indicate exactly the manner of weaving, a square, usually an inch in dimension, is taken from a portion of the surface wherein all the methods of manipulation occur. This square inch is enlarged sufficiently to make the structure comprehensible. This plan enables us to show form and ornamentation in the whole figure as well as the method of treatment in the enlarged inch.

ALEUTIAN ISLANDS.

Mr. William H. Dall has contributed to the National Museum a large number of Aleut grass wallets, conoidal in form when filled (Fig. 1). The warp is of coarse straws, radiating from the center of the bottom. The covering or woof is made by plaiting or twisting two straws in a coil or twine, crossing them between each pair of warp straws. It is as if a twine of two strands had a straw or osier passed down through every half turn (Fig. 2). This plait or twine may be driven close home so as to be absolutely water-tight, or the weaver may leave spaces from one twine to the next wide enough to make a net. A very pretty effect is produced by these Aleutian basket-weavers by splitting the warp straws and twining woof straws around two of the half straws, joining 1 by 2, 3 by 4, 5 by 6, at one round, and the next twine inclosing 0 by 1, 2 by 3, 4 by 5, and so on. This produces a series of lozenge openings (Fig. 2). The split warp strands are often crossed to form X-shaped openings, or carried straight so as to produce parallelograms. I have observed the same effect in Peruvian mummy cloth, but a greater variety of network is there produced by alternating the rectangular and lozenge meshes in bands varying in width.

In the "Smithsonian Contributions to Knowledge," No. 318, plate 7, Mr. Dall figures and describes the matting of the Aleutian Islanders found in the caves in the Catherina Archipelago.

The method of manipulation in the matting is the same as that just described for the basketry of the Aleuts, and the delicacy of workmanship is most admirable. This method of weaving by means of twining two woof strands around a series of warp strands occurs in many places, and will hereafter in this paper receive the name of "twined basketry."

In a covered basket made of split bamboo from the Malabar coast the fastening off at the top of the basket and the weaving of the cover have a three-stranded twine. At every third of a turn the splint that is inward is hooked or passed behind the warp splint at that point. This produces a very smooth effect on the inside and a rough surface without.

The mats of the Aleuts are made of the fiber of the *Elymus** treated as hemp. The ornamentation on the outside of the mats and baskets is formed by embroidering on the surface with strips of the straw instead of the macerated fiber which forms the body of the fabric. The embroidery stitches in these, as in most savage basketry, does not always pass through the fabric, but are more frequently whipped on, the stitches passing always between the two woof strands, as in aresene embroidery, showing only on the outside. Mr. Dall justly praises the marvelous nicety of this Aleutian grass-weaving, both in mats and basketry.

There is no Chinese or Japanese basket in the National Museum showing this plaited weft. The grass of these Aleutian wallets is exceedingly fine, the plaiting done with exquisite care, the stitches being often as fine as 20 to the inch, and frequently bits of colored worsted are embroidered around the upper portion, giving a pleasing effect. The borders are braided in open work from the ends left in the weaving, as follows (Fig. 1):

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* *Elymus mollis*, Sitka, Norton Sound, Kotzebue Sound; *E. arenarius*, Norton Sound, *to Point Barrow; E. Sibiricus*, Sitka. (See Rothrock, Smithsonian Report, 1867.)

At some point on the border, when the solid part of the wallet is finished, the weaver bends two warp strands in opposite directions and gives each a twist with its next neighbor. These two are braided with the next warp thread; these three with the next. Now, start at a proper distance from the first point of departure and braid both ways, as before. These braids will meet and form a set of scallops around the edge, fastened at the ends and loose in the middle. Also, at the apex of each scallop will be a lot of warp straws, braided indeed at the base but loose for any required length. The weaver commences with any set of these to make a four-ply braid, catching up the next set and braiding them in as she went along, and fastening off a set as each new set is taken up. The upper border is thus a continuous braid, connected at regular intervals with the apices of the braided scallops. When the braider reaches her starting point she catches one braid into another, in a rather clumsy manner, and continues to braid a long four-ply string, which, carried in and out the scallops, forms a drawing-string.

ALASKAN ESKIMO.—Two types of baskets are found in close proximity in the neighborhood of Norton Sound—the twined and the coiled. In the former (Fig. 3) the treatment is precisely the same as in those of Aleutian Islands, but the Eskimo wallet is of coarser material and the plaiting is a little more rudely done.

The basketry of this type, however, is very strong, and useful for holding food, weapons, implements of all kinds, and various other articles. When not in use, the wallets can be folded up into a small space like a grocer's paper bag (Fig. 3). In the bottoms of the wallets of this class the weft is very open, leaving spaces at least one-half inch wide uncovered. The borders are produced by braiding four strands of sea grass into the extremities of the warp strands.

Ornamentation is produced by darning or whipping one or more rows of colored grass after the body is formed—not necessarily after the whole basket is completed, for each row of whipping may be put on just after the row of coil on which it is based (Fig. 4). Another plan of attaching the ornamentation is very ingenious but not uncommon. Two strands of colored straw or grass are twined just as in the body of the basket, and at every half turn one of the strands is hooked under a stitch on the body of the basket by a kind of aresene work. This ornament has a bold relief effect on the outside and is not seen at all on the inside.

The coiled variety of the Eskimo basketry, mentioned above (Fig. 5), consists of a *uniform* bunch of grass sewed in a continuous coil by a *whip stitch over the bunch* of grass and through just a few bits of grass in the coil just beneath, the stitch looping under a stitch of the lower coil. When this work is carefully done, as among the Indians of New Mexico, Arizona, and California, and in some exquisite examples in bamboo from Siam and in palm-leaf from Nubia, the most beautiful results are reached; but the Eskimo basket-maker does not prepare her coils evenly, sews carelessly, passing the threads sometimes through the stitches just below and sometimes between them, and does not work her stitches home (Fig. 6). Most of these baskets in the collection of E. W. Nelson have a round bit of leather in the bottom to start upon (Fig. 5, *b*). The shape is either that of the uncovered band-box or of the ginger-jar. Especial attention should be paid to this form of stitching, as it occurs again in widely-distant regions in a great variety of material and with modifications producing striking effects.

The association of this coiled form of basket-making with the marks on the most primitive types of pottery-making has been frequently noticed by archæologists. It is also well known that the modern savages of our Southwest build up their pottery in this manner, either allowing the coils to remain or carefully obliterating them by rubbing, first with a wet paddle of wood, and afterwards, when the vessel is dry, with a very fine-grained stone.

The Eskimo women employ in basket-making a needle made of a bird bone ground to a point on a stone (Fig. 100). Fine tufts of reindeer hair, taken from between the hoofs, are extensively used in ornamentation, especially in the Aleutian area.

TINNÉ INDIANS.

A few specimens of basketry from the vast Athapascan area contiguous to the Eskimo belong to the coiled type (Fig. 7). Instead of a bunch of grass, however, a rod of willow or spruce root is carried around in a coil and whipped on with a continuous splint of similar material (Fig. 8). The stitches of the coil in process of formation, passing regularly between those just below and locking into them, alternate with them and give a somewhat twilled effect to the surface* (Fig. 8). If now a strip of bast or grass be laid on the top of the osier or spruce root coil and carried around with it, and the sewing pass always over these two and down between the bast and the osier of the coil below, a much closer ribbed effect will be produced. Several specimens of this kind of coiled basketry, in which a strip of tough material is laid on top of the coiled osier, were collected at the mouth of the Mackenzie River by McFarlane and Ross, and Mr. Murdoch has shown me a basket similarly wrought, from Point Barrow, which he thinks many have been obtained by barter from the Tinné Indians in the vicinity. The ornamentation on one specimen of this type is very

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*The working of this stitch is described and figured by Paul Schumacher in XII *Report of Peabody Museum*, p. 524: the coils are not, however, interlocked in all cases; that is, if the foundation rods were pulled out the stitches would separate and the whole structure come apart in some cases.

curious and elaborate (Fig. 9). The basket-maker had a number of little loops of bark and quill of different color prepared, and every time a stitch was about to be taken the lower end of one of these loops was caught over the splint thread and held down. The next stitch fastened the two ends of the loops home (that is, each stitch caught the lower part of a new loop and fastened down both ends of the preceding one after it had been doubled back), giving a series of imbrications (Fig. 10). On this specimen are between 3,000 and 4,000 separate loops sewed. This is one of the most striking examples of savage patience and skill, and must have occupied in its construction many hours of a renowned artist.

Mr. Jones tells us, in the Smithsonian Report (1856, p. 323), that the Hong Kutchin Indians, who live on the headwaters of the Yukon River, make basket-kettles of tamarack roots woven very neatly and ornamented with hair and dyed porcupine quills. The water is boiled by means of hot stones thrown in. For dyeing the roots and quills they use berries and a kind of grass growing in the swamps.

In looking at these coiled baskets, standing geographically so far removed from the Apache and Navajo country, one is reminded that the migration which separated these branches of a great stock may have been northward and not southward, and that the Tinné may have carried with them the art of making coiled baskets learned in a region where its beauty culminates.

CHILKAHT INDIANS.

The basket work of these Indians is superb. Every one who sees it is struck with its perfection of workmanship, shape, and ornamentation. All the specimens of the National Museum collection are of the band-box shape; but they can be doubled up flat like a grocer's bag (Fig. 11). The material is the young and tough root of the spruce, split, and used either in the native color or dyed brown or black. The structure belongs to the twined or plaited type before mentioned, and there is such uniformity and delicacy in the warp and woof that a water-tight vessel is produced with very thin walls. In size the wallets vary from a diminutive trinket basket to a capacity of more than a bushel. All sorts of lovely designs in bands, crosses, rhombs, chevrons, triangles, and grecques are produced thus: First, the bottom is woven plain in the color of the material. Then in the building up of the basket bands of plain color, red and black, are woven into the structure, having the same color on both sides. Afterwards little squares or other plain figures are sewed on in aresene, that is, only half way through, giving the most varied effect on the outside, while the inside shows only the plain colors and the red and black bands. The wild wheat straws are used in this second operation, whipped over and over along the outer threads of the underlying woof, or two straws are *twined around in the* manner explained above (page 293, bottom).

No more attractive form and ornamentation of basketry are to be seen than those produced by the Indians of this Thlinket stock extending from Mount Saint Elias to Queen Charlotte Archipelago, including Sitka.

HAIDA INDIANS.

These Indians live on Queen Charlotte Archipelago and adjacent islands. Their basket work differs in form from that of the Chilkahts, or Thlinkets, owing probably to the demands of trade; but the twined method is followed (Fig. 12) and the ornamentation is produced in a similar manner. The quality of the ware, however, is a little degenerated and more gaudy (Fig. 15). The Haidas are very skillful in imitating all sorts of chinaware in basketry, such as teapots, sugar bowls, toilet articles, table mats, bottles, and hats. They also introduce curved lines and spirals with good effect. The basketry hats of spruce roots, the most striking of their original designs, are made by the twining process (Fig. 14). The crown is twined weaving of the most regular workmanship and the fabric is perfectly water-tight when thoroughly wet (Fig. 15). An element of ornamentation is introduced into the brims by which a series of diamond patterns cover the whole surface (Fig. 16). This decoration is produced thus: Beginning at a certain point the weaver includes two warp strands in a half twist, instead of one; then makes two regular twists around single-warp strands. The next time she comes around she repeats the process, but her double stitch is one in advance of or behind its predecessor. A twilled effect of any shape may be thus produced, and rhombs, triangulated fillets, and chevrons made to appear on either surface.

The "fastening off" of the work is done either by bending down the free ends of the warp and shoving them out of sight under the stitches of the twisted web, or a braid of four strands forms the last row (Fig. 16), set on so that the whole braid shows outside and only one row of strands shows inside. The ends of the warp splints are then cropped close to the braid. This appearance of the entire four-stranded braid on the external surface is produced by passing each of the four strands alternately behind one of the warp sticks as the braiding is being done (Fig. 16). (Compare this with what was previously said about the basket from the Malabar coast, page 292.)

Special attention should be paid to the painted ornamentation on these hats (Figs. 14 and 15) showing head, wings, feet, and tail of the duck, laid on in black and red in the conventional manner of ornamentation in vogue among the Haidas and used in the reproduction of their various totems on all of their houses, wood and slate carvings, and the ornamentation of their implements.[*]

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[*] A very interesting instance of survival is to be seen in the rag carpets of these Indians. The missionaries have taught the women to save up their rags and to cover their floors with pretty mats. They are allowed to weave them in their own way, however, and the result is a mat constructed on the ancient twined model, precisely as the weaving is done on the mats and hats.

The method of manufacture of Haida twined basketry is shown by Mr. J. G. Swan in a specimen collected expressly for the National Museum (Figs. 17–19). Mr. Swan says, "This style of making baskets differs from that of Cape Flattery. There the women sit on the ground and weave baskets and mats, both of which rest on the ground."

With the Haidas the mats are suspended on a frame and the baskets supported on a stick as in Fig. 17. The black color of the spruce root used in making ornamental patterns is produced by soaking it in the mud. Fig. 18 shows the bottom of the basket made by the twining process. The border of the bottom is marked off by a row of double weaving or a twine built outside the body of the basket just as in the Eskimo basket before described (page 293). A section of the structure is shown in Fig. 19 where the border ends.

BILHOOLAS, ETC.

Along the coast of British Columbia the great cedar (*Thuja gigantea*) grows in the greatest abundance, and its bast furnishes a textile material of the greatest value. Here in the use of this pliable material the savages seem for the first time to have thought of checker-weaving (Fig. 20). Numerous mats, wallets, and rectangular baskets are produced by the plainest crossing of alternate strands varying in width from a millimeter to an inch (Fig. 21). Ornamentation is effected both by introducing different-colored strands and by varying the width of the warp or the woof threads. In several examples the bottom of the basket is bordered with one or more lines of the twined or plaited style of weaving, to give greater stability to the form. Cedar mats of great size and made with the greatest care enter as extensively into the daily life of the Indians of this vicinity as do the buffalo robes into that of the Dakota Indians. They may be seen upon the floors, sleeping berths, before the doors of the houses, and they are also used as sails for their boats and wrapped around the dead.

It is not astonishing that a material so easily worked should have found its way so extensively in the industries of this stock of Indians. Neither should we wonder that the checker pattern in weaving should first appear on the west coast among the only peoples possessing a material eminently adapted to this form of manipulation. It is only another example of that beautiful harmony between man and nature which delights the anthropologist at every step of his journey.

MAKAHS AND CHIHALIS.

We are now introduced to still another style of basketry, very primitive but capable of very delicate treatment. I do not know of its existence outside of the Nutka stock living on the southwest side of Vancouver Island and on the northwest corner of Washington Territory, except in two cases, to be presently mentioned. It may be called the "fish-trap *style*," since without doubt the finer basketry is the lineal descendant of the rude wicker fish-trap. Imagine a number of stakes driven into the ground pretty close together. A horizontal pole is laid against them in the rear, and by the wrappings of a withe around the pole and each upright stake diagonally on the outside and vertically on the inside, a spiral fastening is produced (Fig. 23). This stitch crosses the two fundamentals in front at an angle and the horizontal frame-piece in the rear at right angles, or *vice versa*, and the lacing may always run in the same direction, or the alternate rows of lacing may run in opposite directions, as in Fig. 23. As a matter of fact, in soft and pliable material this operation constantly pushes the uprights forward a little, giving to the fabric an appearance of the back of a watch (Figs. 24–26).

The Clallam Indians of the Selish stock make a carrying basket in this manner (Figs. 22, 23), the frame (warp and woof) sticks being about one-eighth inch in diameter, lashed in place with split ozier or root. The Japanese also make a fish-trap similarly, with the exception that the coiled splint passes alternately backward and forward, so that if the horizontal were pulled out the fabric would tumble to pieces. The oblong oval shields of bamboo, made by the Bateke negroes of the Lower Congo, imitate this structure exactly. The frame of the shield is an oblong hoop on which are stretched splints of rattan, running longitudinally on one side and transversely on the other, crossing at right angles except at the plano-convex space at the ends. Splints of bamboo, about one-eighth inch wide, are woven into these cross strands precisely after the manner of the Makah basketry, the consequence being a series of square stitches on the back and diagonal stitches on the front, closely fitting, and coving the surface completely. Now, if the frame were cedar-bark threads about the size of pack threads, and the lashing of white sea-grass, we would have the Makah basket (Figs. 24–26). It takes three sets of threads (Fig. 25), the radiated warp, the coiled woof, and the spiral-binding thread, to finish the compound. No other area is known to the writer where this peculiar pattern is wrought into delicate fabrics. The Makahs belong to the Nutka stock, most of which are on the southwest shore of Vancouver Island, including the great group of Aht tribes. No Aht basketry is in the Museum, but it would be extremely interesting to trace this unique method of basket-weaving among all the tribes of the stock. Bands of serrate patterns are produced in color by using different wrapping threads, the principal one being grass dyed black in mud.

There is one specimen of the cedar-bark mat from Vancouver Island in which the shreded bark which serves for warp is fastened at intervals of about an inch by a chain-stitch instead of the twine. This must have been a modern innovation; at least there is not another evidence in this collection of savage acquaintance with the chain-stitch.

The Clallams, adjoining the Makahs, but of the Selish or Flathead *stock, in addition to* the fish-trap or bower style, are the first going southward to produce a twilled pattern over the entire surface of the vessel (Figs. 27, 28). A slight exception to this statement is the ornamentation on the brim of the Haida rain-hat. It occurs again in Mexico and among the Cherokees, Choctaws, Chetimachas, and in South America. A moment's reflection will show that the administration of the three-ply method of the Makahs is a derivation of the plicate or twisted sort. If either strand of a twist, the inner or the outer, be drawn straight, the plait will become the fish-trap pattern. In most of the Makah baskets the straight piece is laid inside the uprights, but there are examples in which it is laid outside resembling the regular plaited stitch. The Indians of this coast prior to the advent of the white man made heavy and beautiful blankets of the wool of the Rocky Mountain sheep, and of the hair of animals killed in the chase, dyed in different colors. The patterns are all geometric, and are, in fact, woven mosaics, each figure being inserted separately by twisting two woof threads backward and forward around the warp strands. Scarcely ever does the twine extend in stripes all the way across the blanket in a direct line.

Like the Haidas the Makahs prepare a great many forms of basketry for trade. A great variety of colors is used in the decoration. The hatch surface, produced by the use of three strands in weaving, gives to the basketry of this type a very unique and pleasing effect. Fig. 25 represents a common specimen of Makah basketry.

Fig. 29 shows a bottle covered with ornamental basketry. In the bottom the radiating warp is inclosed in the twined weft. The warp threads are carried over the surface of the bottle, crossing each other and producing rhomboids, after the manner of the Japanese basketry. The twined coil (Fig. 31) connects the crossings of the warp threads. This is a very interesting specimen, inasmuch as the bower or fish-trap style is replaced by the regular twined weaving of the Indians farther north.

Figs. 32, 33 represent a specimen from the Clallams, which seems to be an example of commerce. The coil is sewed on conveniently, and the ornamentation upon the sides is produced by laying the straw or quill of different color upon the regular stitching, and sewing it on one stitch over two original stitches. This is a very beautiful and strongly made specimen.

OREGON AND CALIFORNIA TRIBES.

Along the western coast of the United States from Puget Sound to Lower California are many separate stocks of Indians, quite easily recognized by the material and ornamentation of their basketry, but following two fundamental structures—the twined and the whipped coil. Some of these tribes are called Diggers because they subsist on roots, seeds, etc. It would be more reasonable to call them "basket Indians." The Klamath and the McLeod Indians of Northern California use the twined method, making water-tight and flexible baskets of great beauty (Fig. 34). The ornamentation is produced by the alternation of black and white threads in stripes and geometric figures of endless variety (Fig. 35). A very pretty coarse wallet is produced by using vertical rushes for the foundations and twining bands of two or three rows at intervals of a few inches.

The coiled and whipped structure is employed by many tribes throughout California (Figs. 36, 37, from Eel River tribe). In most of them the double coil is used; that is, two rods or osiers are carried around, or an osier overlaid with a strip of bark or yucca (See Tinné Indian baskets, page 294.) The sewing is over both and down under only the upper one of the coil just beneath. Some of the baskets of this area are of the greatest beauty, both in form, texture, and in ornamentation.

The principal shapes are the inverted truncated cone, the ginger jar, and the shallow dish or tray. From willow twigs and pine roots they weave large, round mats for holding acorn flour; various sized, flattish, squash-shaped baskets, water tight; deep conical ones of about a bushel capacity to be carried on their backs; skull caps, which are also drinking cups, worn by the squaws. They ornament the baskets by weaving in black rootlets or bark in squares, diamonds, and zigzags. (Powers: Cont. N. A. Ethnology, III, p. 47.)

On Tule River long stalks of Sporobolus are used for warps. For thread pine root is used for white, willow bark for the brown, and some unknown bark for the black. The needle is a sharpened thigh-bone of a hawk. (Id., p. 377.)

The Modok women formerly made a baby-basket of willow-work, in shape resembling a tailor's slipper or an old-fashioned watch-holder, and having various devices to shade the face. The warp is of straight rods, the woof consists of bands of twined work, just enough to hold the warp together, most of the space being left open. Some of the Northern California tribes make a baby-basket similar in shape to the Sioux and Cheyenne beaded cradle-boards.

The Californian Indians from Tulé Lake to the Gulf of California use the greatest care in securing uniformity and fineness to the foundation and the stitch. Their skill will compare favorably with that of the Siamese, who do very similar work. The needle is the long bone of a bird or mammal, the joint remaining for a handle and the point being forward of the central hard portion of the bone. The female basket-weaver pierces a hole in the fabric at the proper point, draws the thread of grass or woody fibre through the aperture, biting the end to sharpen her thread if necessary, and presses the stitches home with the bone needle.

The ornamentation is in color, pattern, and accessories. The natural color of the material is the basis of the basket. A very dark brown and a very light brown colored straw is worked into chevrons and zigzag lines in endless variety. A strip of reed or grass is sometimes carried around on the outside, concealed by two, three, or more stitches, then overlapping the same number, forming a checkered band. Beads are also laid on, and bits of worsted, even, making animal forms. The most beautiful ornament is that produced by feathers, one being laid on for each stitch, forming an imbricated covering, concealing the entire surface. When parti-colored feathers are used the effect is very wonderful.

SAHAPTIN STOCK.

In the mountains of Idaho live the Nez Percés Indians belonging to the Sahaptin stock. The Museum possesses a few samples of their basketry. Figs. 38, 39, represents a flexible wallet made of the bast of Indian hemp (*Apocynum cannabinum*). There is nothing remarkable in the manufacture of this specimen. The weaving belongs to the twined type.

The body color is the natural hue of the material. Nearly the whole surface, however, is covered with ornamentation in patterns of brown, green, red, and black. This ornamental portion is produced by the sewing of embroidery over the entire surface of the bag, the stitches passing only half way through, so that the fabric is plain on one side and ornamented on the other.

THE GREAT INTERIOR BASIN.

Leaving now the west coast, we may examine the basketry of the Great Interior Basin, including that of the Shoshones, the Apaches, the Pueblos, and the tribes living around the mouth of the Colorado.

Shoshones.—This great stock of Indians employ both structures, the twined and the whipped coil. The plaited stitch is used in the conoidal basket hats or mush bowls (Figs. 40, 41), the roasting trays (Fig. 42), and the fanning or seed gathering trays (Fig. 43), and wands (Fig. 44). The coiled and whipped structure is used in the pitched water bottles (Fig. 45), and the basket trays (Fig. 47).

Conoidal basket hats are made of willow splints or Rhus, the warp radiating from the apex, the woof splints being carried around and twined in pairs, in the manner so frequently described (Fig. 40). The woof is so thoroughly driven home as to give the appearance of the simple osier of the east. Ornamentation is produced by using one or more rows of black splints, dyed with the *Sueda diffusa.*

The roasting trays are shaped like a scoop, rimmed with a large twig (Fig. 42). The warp is made of parallel twigs laid close together, and held in place by cross plaitings about half an inch apart. It is said that Shoshones place the seeds of wild plants in these trays with hot stones and thus roast them. The specimen figured is much charred on the upper side. Dr. Edward Palmer also describes their use in fanning the hulls and epidermis of the *Pinus monophylla* seed. "The Indians remove the hulls by putting a number of nuts on a metate and rolling a flat pestle backward and forward until the hulls are loosened. The mass is then put in a flat basket tray and the hulls blown off." (Am. Nat. 1878, p. 594.)

In Schoolcraft's History of Indian Tribes, pt. 5, pls. 26, 27, will be seen Indian women gathering seeds in conical baskets, beating the plants with a spoon-shaped wand towards the basket, held in the left hand, with the mouth of the basket just under the plants (Figs. 43, 44). The baskets are made in every respect like the conoidal hats and the fans are made of twigs closely woven on the same pattern.

The water bottles belong to the coiled and whipped structure. As before mentioned, this style can be made coarse or fine, according to the material and size of the coil and the outer thread. If two twigs of uniform thickness are carried around, the stitch will be hatchy and open; but if one of the twigs is larger than the other, or if yucca or other fiber replace one of them and narrower sewing material be used, the texture will be much finer. These bottles differ in shape; one class has round bottoms, another long, pointed bottoms; one has wide mouths, another small mouths; one class has a little osier handle on the side of the mouth like a pitcher, but the majority have one or two loops of wood, horse-hair, or osier fastened on one side for a carrying strap. All of these are quite heavy, having been dipped in pitch. The same form is found among the Apaches, Mohaves, Mokis, and Rio Grande Pueblos; but it is not improbable that they were obtained from the Utes in barter or by purchase.

The basket trays of the Utes do not differ essentially in general style from those of the Gila River tribes, but they are much coarser. Among the coiled basket trays in the collection accredited to the Utes are indeed two styles, but one of them resembles so much those of their Apache neighbors on the south as to raise the suspicion that they were obtained by barter. However that may be, we are permitted to call them the Ute pattern and the Apache pattern. The Ute basket tray is made like the Ute water-bottle. A bundle of grass stems, two, three, or four, are coiled around and sewed to the upper twig of the coil just below. By the way in which the coil turns it is easy to tell whether the upper or the under surface was towards the sewer, the work always necessarily moving to the left hand. As a matter of fact, most of these coarse baskets were built up with the concave towards the workman, that side presenting a more finished appearance. On the other hand, the finer baskets, here called Apache, are coiled the other way. The foundation is a slender bundle of yucca fiber or a twig and yucca leaf combination, which enables the workman to produce a compact water-tight stitch similar to that in the California baskets just described. The Apaches understand thoroughly the use of this stitch, and their ornamental patterns in black have the greatest variety. The ornament of one specimen in the collection, supposed to be Apache, but possibly made by some California tribes, consists of a series of spiral bands widening from the bottom towards the rim; in each of the spiral bands a row of five men extends from midway in the basket to the upper edge, their places below being taken by smaller patterns* (Figs. 49–65).

Moki baskets.—Of the seven Moki pueblos six speak the Ute language. It will not be surprising also to see them making similar baskets. This is partly true and partly false. The Moki have both coiled and plaited or twined baskets. Their twined baskets are few in number. Their coiled baskets, except the water-bottles, are of a perfectly unique pattern. In addition, they use one method of work common enough in other parts of the world, but thus far unknown west of the Rocky Mountains. I speak of the common single-coiled osier or splint employed by all eastern Indians and by the negro and white basket-maker. The Moki also imitate the checker weaving of the Bella Bellas, and the twilled weaving of the Clallams.

The plaited ware of the Mokis are a few peach-baskets, made in the same manner as the Ute hats, but there is enough dissimilarity of form to give the Moki the credit of inventing this peculiar style (Figs. 66–79).

The coiled and sewed ware, aside from the water-bottles and a few bread-trays, which are evidences rather of barter than manufacture, demand our special attention. Among the Mokis and nowhere else, so far as the Museum is concerned, except in Nubia, are to be found thick-coiled baskets called sacred meal-trays, having about the concavity of old fashioned pie-plates, and varying in diameter from a few inches to over twenty. A bundle of grass or the nerves of the yucca leaf, from half an inch to an inch in diameter, is coiled around and sewed with strips of yucca leaf of uniform width, rarely exceeding the twelfth of an inch. The thread is passed regularly around the coil, drawn tightly, and passed between threads and through a few fibers of the grass in the coil beneath. It is difficult to tell whether any pains is taken to lock the threads of the coils or not. At first the coil is very small and widens as the dish enlarges. These plates are all made to be looked at inside, the coiling being invariably towards the left on the upper surface. I have not seen one exception. True to this instinct, when a Moki constructs a hat of the same material to please some white man, he makes the convex of the hat correspond to the concave of his tray, the outside of the hat being thus rough and the inside smooth. The ornamentation of these trays is produced as follows: One side of

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[*NOTE.—Says Dr. E. Palmer: "In Utah, Arizona, Southern California, and New Mexico the Indians depend solely on the *Rhus aromatica*, var. *tribola* (squawberry) for material out of which to make their baskets. It is far more durable and tougher than the willow, which is not used by these Indians. The twigs are soaked in water to soften them and to loosen the bark, which is scraped off by the females. The twigs are then split by the use of the mouth and hands. Their baskets are built up by a succession of small rolls of grass, over which these twigs are firmly and closely bound. A bone awl is used to make the holes under the rim of the grass for the split twigs. Baskets made thus are very durable, will hold water, and are often used to cook in, hot stones being dropped in until the food is done." (Am. Nat. 1876, p. 598).]

the stripped yucca leaf is dark green, the other light green and white striped fading into yellow. Now by deftly turning the thread where it passes through the coil in sewing a variety of shades is produced, as in shaded worsted work. Again, by dyeing the threads black, blue, red, yellow, and combining color effects with the natural shades of the leaf, the most beautiful ornamentation is produced. There is some method in the patterns which usually commences from a blank center of a few coils with four brown spots of six stitches each. From these fundamental points all sorts of geometric figures are produced by the simple process of sewing with different-colored threads.

The coiled and decorated ozier bread-trays of the Mokis are made, I have been informed, at only one pueblo, Oraibi. The frame consists of two cross sets of twigs, from 12 to 16 in each bar of the cross. These are firmly held together at their intersection by sewing and plaiting. They then are spread out radially, the space being from time to time supplemented by additional twigs. The workman provides himself with bunches of white, yellow, orange, purple, black, blue, and green twigs only a few inches in length. These he proceeds to weave into patterns of the greatest beauty, even imitating cloud effects seen on Japanese screens, using short or long twigs as the occasion demands, hiding the ends between the ribs and the filling of the preceding coils. The process is the same as that employed by the Navahos in making the clouded blankets, and by the northwest coast Indians in their ancient mountain-sheep blankets. The greatest variety of ornament is produced, but, as in the coiled work, the center is always plain. Under the influence of trade, however, the ancient patterns are giving way to those demanded by the purchasers. As the patterns are really mosaics and could be picked out it will be easily seen that the figures on the back and front do not exactly conform, the corresponding square on the back being always one space to the right or left of the same in front.

The Moki common twig basket is as rough as rough can be; the same is true of the flat mats used about their dwellings. They are woven in the same manner as the market baskets which we are accustomed to see every day. The twilled effect on the flat mats is produced by overlapping two warp strands by each of the woof strands.

Yucca baskets and trays of a very coarse character are made by the Mokis, woven sometimes in plain checker, at other times in twill. Although the material is very coarse, quite pleasing effects are produced by the two sides of the leaf and by the different shades of the same side.

Zuñi basketry.—Although one may see at Zuñi all sorts of baskets, the most of them, including coiled or whipped trays, Moki coiled and twig basket trays, none of these are made there. The only basket of the Zuñis is their little, very rough twig peach basket, hardly worthy of notice except for its ugliness and simplicity (Figs. 80–82).

SOUTHERN INDIAN BASKETRY.

In the States of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana are many Indians still living, remnants of the Cherokees, Choctaws, Creeks, Chickasaws, and Seminoles, removed fifty years ago into the Indian Territory. Through the lowland portion of these States grow the interminable cane-brakes, and from the split cane all these tribes make their basketry. They all follow the twilled pattern of the common checker weaving. If there is any one tribe that excels it is the Choctaws, who even now expose for sale in the markets of Mobile, New Orleans, and other southern cities little baskets of green, yellow, red, and black cane, woven in twill, crossing with the woof two or more warp splints, and managing the stitches so as to produce diamonds and various zigzag patterns on the outside. They make a basket oval at the top and pointed below for presents, averring, as I was informed by a gentleman well acquainted with them, that this shape imitated the heart, which should always accompany every gift. The handles of their basketry are very clumsily put on, marring greatly the appearance of the otherwise attractive object (Figs. 85–95).

ALGONKIN AND IROQUOIS BASKETRY.

All along our northern frontier and in many parts of Canada the descendants of the once powerful Algonkin and Iroquois fabricate baskets from the birch, linden, and other white woods. The method of manufacture is universally the same: it is the plainest in-and-out weaving. The basketry is very far from monotonous, however, for the greatest variety is secured by difference of form, of color, of the relative size of the parts, and of ornamentation. In form these baskets run the whole gamut as among the Haida and the Maka, guided by the maker's fancy and the demands of trade. These Indians all live on the border of civilization and derive a large revenue from the sale of their wares. The colors are of native manufacture, red, yellow, blue, green, alternating with the natural color of the wood. By changing the relative size of the parts a great variety of effects is produced. To commence with the rudest, let us take a dozen or sixteen strips of paper half an inch wide, and cross them so as to have one-half perpendicular to the other, woven in checker at the center and extending to form the equal arms of a cross. Bend up these arms perpendicular with the woven checker and pass a continuous splint similar to the frame-work round and round in a continuous coil from the bottom to the top. Bend a hoop of wood so as to fit the top, bend down the upright splints over this, and sew the whole together with a whipping of splint, and you will have the type basket. Now, by varying the width of the splint used to cover the sides you secure a great difference of appearance. In the National Museum are baskets made of uniformly cut splints not over the one-sixteenth of an inch in width.

Finally the Algonkin and Iroquois as well as the Southern Indian know how to decorate in baskets with a great variety of rolls looking much like the napkins on the table of a hotel. He draws a splint under the warp stick, gives it a turn up or down, or two turns in different directions and draws his loose end tightly under the next warp stick but one. This operation he repeats, forming around his basket one or more rows of projecting ornaments.

CENTRAL AND SOUTH AMERICAN BASKETRY.

The Museum is not rich in South American baskets. Those from British Guiana are precisely like those described by E. im Thurn in his work entitled "Among the Indians of British Guiana." The specimens in hand are all of the twill pattern, wrought from a brown vegetable fiber which shows the same on both sides. This twill is used with good effect in the diagonally woven cassava strainers, which may be contracted in length by a corresponding increase of the width. When the grated cassava is packed into this strainer it is suspended and a great weight fastened to the bottom. The same device in cloth is used by country housewives in making curds. There is an entire lack of gaudy dyes in the Guiana baskets, the only colors being the natural hue of the wood and a jet-black varnish. The gorgeous plumage of the birds replace the dyes in ornamentation. Central American basketry does not differ greatly from that of South America except in the finish. Nothing can exceed in severe plainness and accuracy of execution the finer ware of Guiana.

PLATE I.

(Mason. Basket-work.)

FIG. 1. Aleutian twined wallet of sea-grass. The warp consists of a number of straws radiating from the bottom. As the basket enlarges new straws are inserted, and the whole is held in place by twine made of two straws, which inclose a warp straw at each half turn. The cylindrical part of the vessel is of the diamond pattern shown in Fig. 2. The ornamentation is produced by embroidering with bits and strands of red, blue, and black worsted, in no case showing on the inside of the wallet. The continuous line between the diagonal stripes is formed by whipping with a single thread of worsted on the outer stitches of one of the twines of straw. Whipping with single thread in this ware is not common. The border is formed of the very complicated braid described in the text. Collected in Attu, by Wm. H. Dall. Museum number, 14978.

FIG. 2. A square inch of Fig. 1 enlarged, taken from the part of the texture where the rectangular meshes pass into the lozenge-shaped meshes. The peculiar method of splitting the warp threads and working the halves alternately to the right and to the left is well shown.

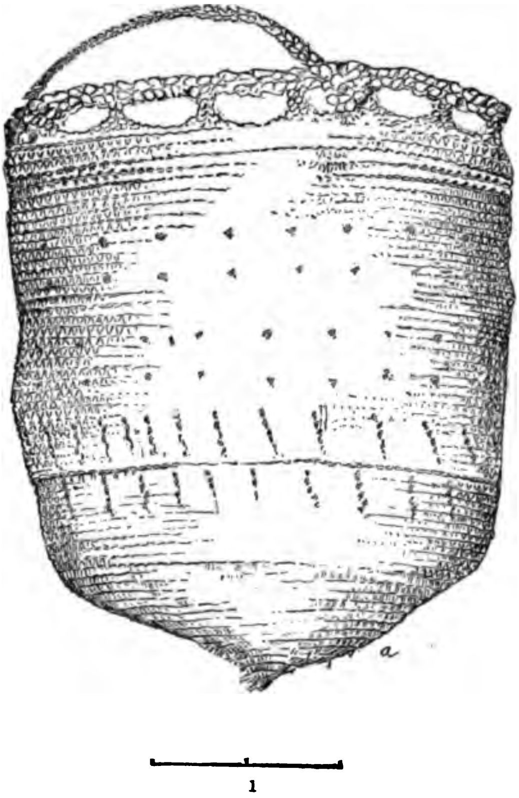


FIG. 1. Aleutian twined wallet.

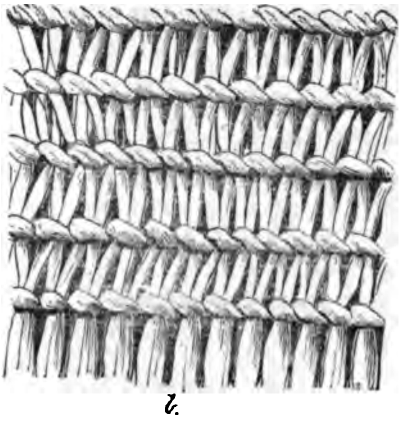


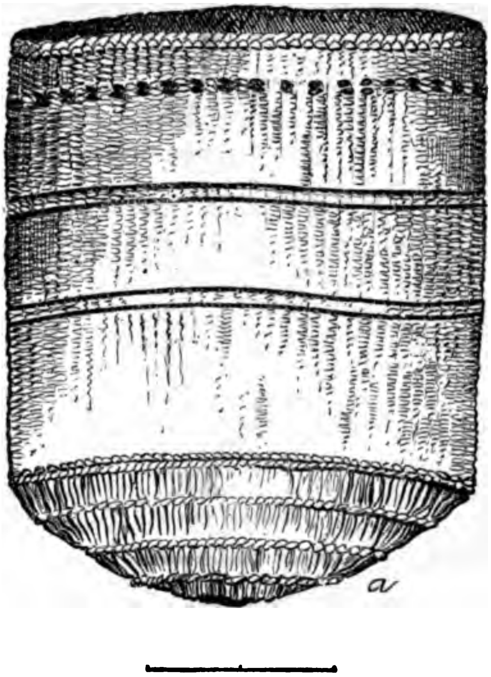
FIG. 2. One square inch of Fig. 1, enlarged.

PLATE II.

(Mason. Basket-work.)

Fig. 3. Twined wallet of the Eskimo. The warp and the twining of the bottom is of a very coarse, rush-like, fiber. The bottom is in openwork and is strengthened on its outer edge by an extra twine set on externally. The body is of a dirty rush color, the spotted lines on the cylindrical portion are in black and body color. This effect may be varied by mixing two strands of different color in the twine. The fastening off at the top is done by working the warp strands into a three-ply braid, turning down on the inside of the vessel and cutting off an end whenever a new warp thread is taken up by the braid. Frequently the last three or four warp straws are not cut off but braided out to their extremities in order to form a handle. Collected at Norton Sound, by E. W. Nelson. Museum number, 38872.

Fig. 4. One square inch of Fig. 3, representing (1) four rows of twining on the cylindrical portion; (2) the method of adding a new row of twining externally for a boundary between the bottom and the cylindrical portion, and (3) the method of forming an open-work bottom.



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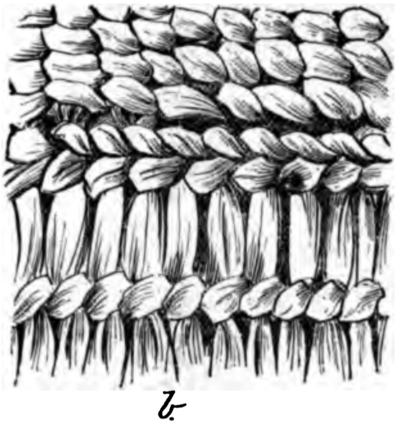

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FIG. 3. Eskimo twined wallet. FIG. 4. One square inch of Fig. 3.

PLATE III.

(Mason. Basket-work.)

FIG. 5. Coiled Eskimo basket. The bottom is a bit of old leather, to which is sewed, by means of grass thread, a coil of straws varying in thickness from ⅛ to ¼ inch. This coil is continued to form the cylindrical side, the shoulder at the top, and the neck. The disk-like cover is made in the same manner. Collected by E. W. Nelson, in Norton Sound. Museum number, 38469.

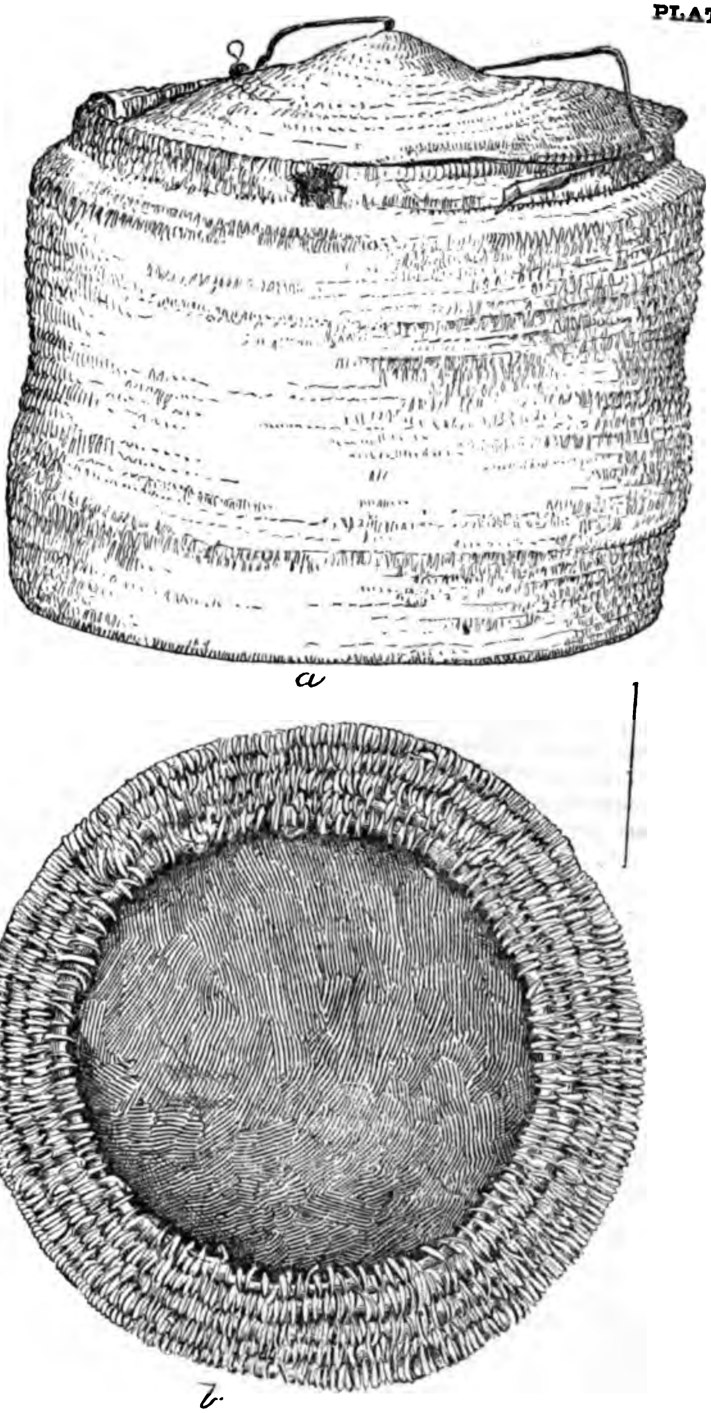

FIG. 5. Eskimo coiled basket.

PLATE IV.

(Mason. Basket-work.)

FIG. 6. One square inch of Fig. 5 enlarged, showing the bunch of straws used as the body of the coil, and the manner of whipping the turns of the coil with grass threads. Instead of carefully looping the thread into the one just below, as is done in the best coiled work, the basket-maker passed the sticks indiscriminately through or between those below. Some of the Eskimo baskets, however, resemble those of the next class.

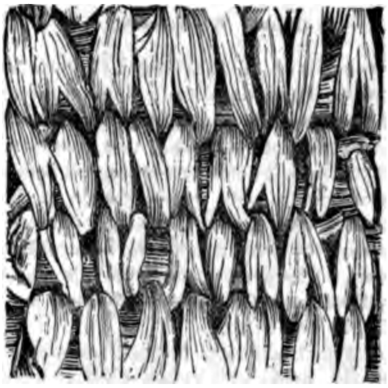

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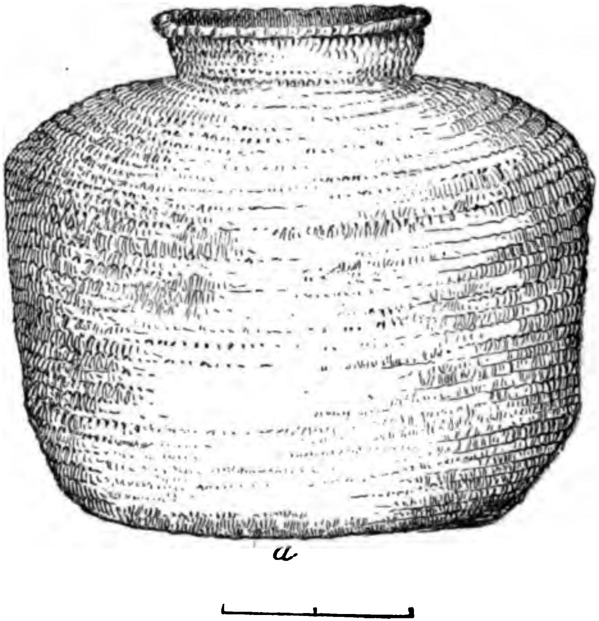
FIG. 6 One square inch of Fig. 5.

PLATE V.

(Mason. Basket-work.)

FIG. 7. Coiled basket of the Tinné or Athabascan Indians of Alaska and British America. The warp or foundation is a single osier or spruce root, the sewing is done with small splints of spruce root. The stitches vary from $\frac{1}{8}$ to $\frac{1}{4}$ inch in length, and the splints from $\frac{1}{16}$ to $\frac{1}{8}$ inch in width. The stitches of each coil are locked into the stitches of the coil beneath in addition to passing under the fundamental rod. In some cases the Eskimo fashion of splitting the threads in sewing appears, but the evidence shows that the Tinné were the teachers of the Eskimo, and the latter follow only the ruder work of their preceptors. The general shape of this class of baskets is that of a low narrow-mouthed jar. Collected by Lucien M. Turner, Lower Yukon River. Museum number, 24342.

FIG. 8. One square inch of Fig. 7, showing the method pursued in coiled basketry with a single fundamental and a single splint of osier or spruce root.



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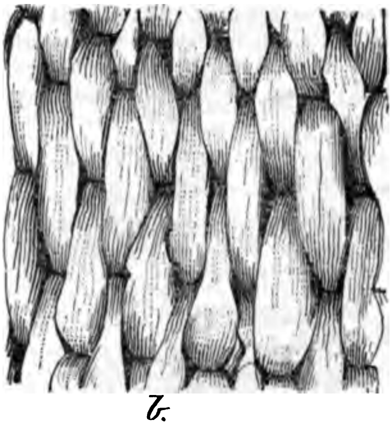

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FIG. 7. Tinné coiled basket.

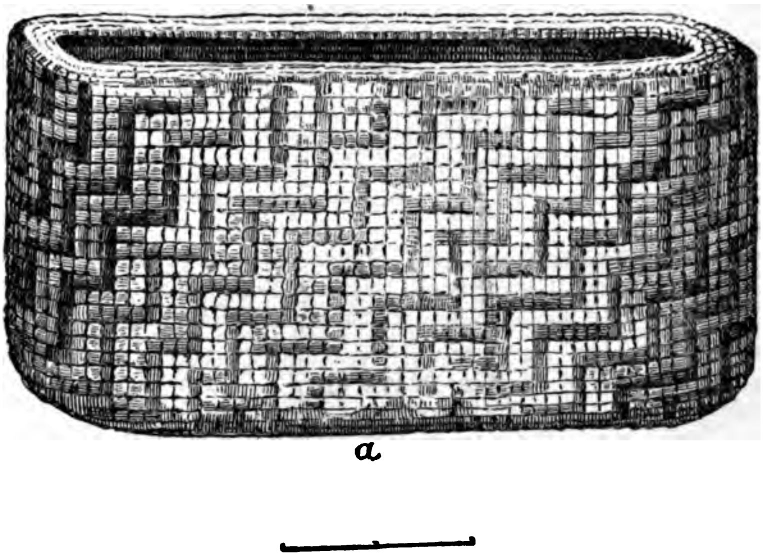
FIG. 8. One square inch of Fig. 7.

PLATE VI.

(Mason. Basket-work.)

FIG. 9. Alaskan Indian coiled basket. The outer portion is so covered with ornament as to conceal the texture of the basket, which is built up by whipping a coil of rushes or small splints with splint or birch bark. The bottom of this basket is not a coil, but a number of straight foundation rods sewed into a rectangular mat, around this the sides are built up by coiling. The elaborate ornamentation is described under Fig. 10. Collected in Alaska, by J. J. Maclean, in 1882. Museum number, 60235.

FIG. 10. One square inch of Fig. 9, showing the elaborate ornamentation. The imbricated effect upon the surface is produced by sewing on little loops of bark and straw, white and brown, with blind stitches in such a way as to conceal the manner of attachment. The mat-like bottom is ornamented by sewing on straws longitudinally with stitches wide apart, so as to show a checker pattern of straw and stitching. This method of ornamenting the bottom is often pursued over the whole external surface of the basket.



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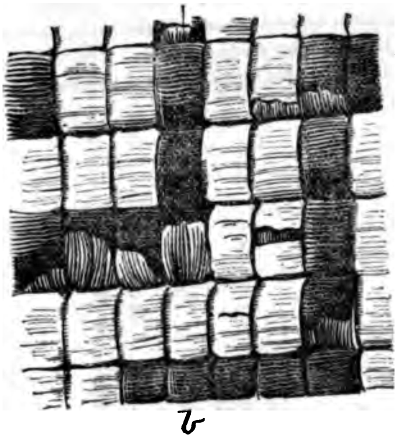

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FIG. 9. Alaskan Indian coiled basket.

FIG. 10. One square inch of Fig. 9.

PLATE VII.

(Mason. Basket-work.)

FIG. 11. Twined basket-wallet of the Chilkaht Indians (Thlinkit stock), band-box shape when spread out. The bottom is very roughly made of spruce-root splints, warp and twine, the former radiating from the center. The boundary of the bottom is a single row of twine fastened on externally. The cylindrical portion for a few inches above the bottom is in natural brown color, excepting two or three vertical bands of embroidery. The rest of the body is in stripes of natural color, black and Indian red. The border is formed by turning under the warp threads and cutting them off. The geometric patterns (different on every wallet) are formed by embroidering upon the outer surface, half through the fabric, with yellow, light red straws and spruce-root dyed. This style of basketry is followed by the Haidas in the baskets made for sale. Collected at Sitka, Alaska, by Dr. J. B. White, in 1876. Museum number, 21560.

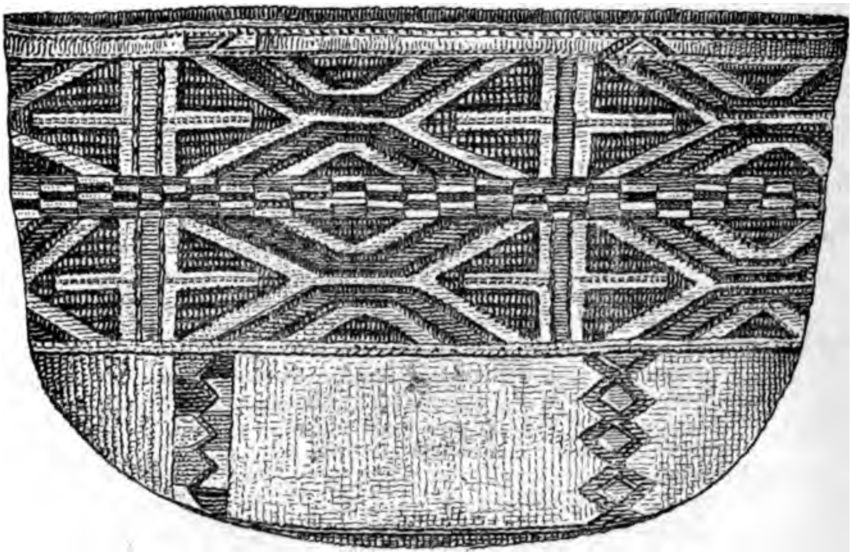


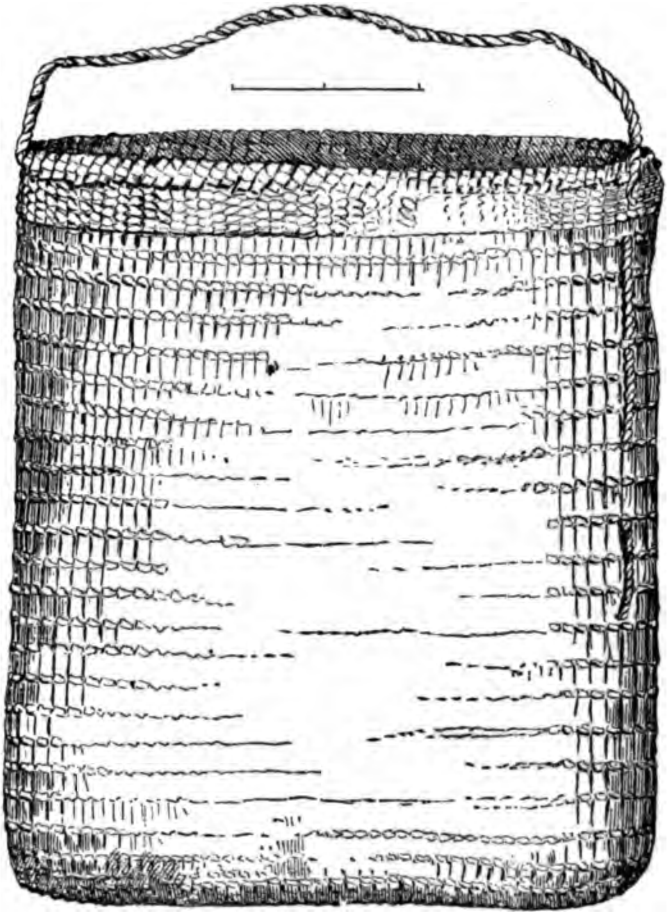
FIG. 11. Chilkaht twined and embroidered basket wallet.

PLATE VIII.

(Mason. Basket-work.)

FIG. 12. Twined basket of spruce root, made by Haida Indians. This specimen shows better than any of the preceding the method of administration in the twined basketry. The handle is a twine of spruce root fastened on by weaving in and out on the side, the lower end knotted. The fastening off at the rim is done by bending down the warp threads externally and sewing them flat with one row of twining. Collected by James G. Swan, in Queen Charlotte Archipelago, in 1883. Museum number, 88964.

FIG. 13. One square inch of Fig. 12 taken near the top, so as to show the close and the open weaving. The method of twine weaving is perfectly shown in this figure.



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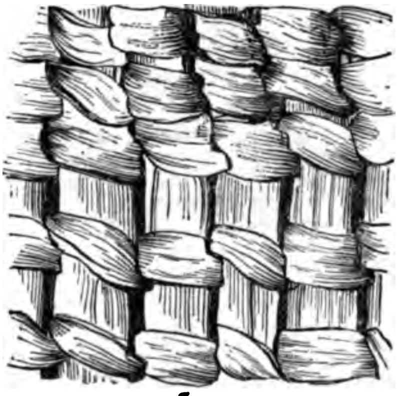

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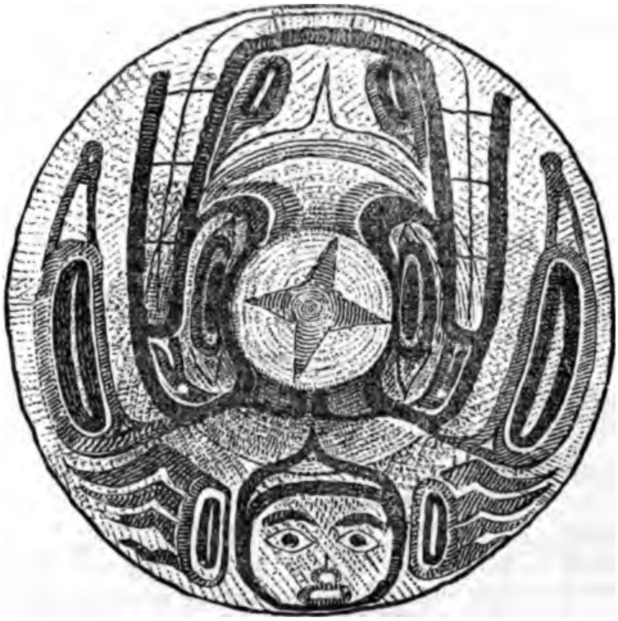
FIG. 12. Haida twined open-work basket. FIG. 13. One square inch of Fig. 12.

PLATE IX.

(Mason. Basket-work.)

FIG. 14. Rain hat of twined basketry in spruce root from Haida Indians, reduced to one-eighth linear. This figure is the upper view and shows the method of ornamentation in red and black paint. The device in this instance is the epitomized form of a bird, the first step from pictures toward graphic signs. Omitting the red cross on the top, the beak, jaws, and nostrils are shown above; the eyes at the sides near the top, and just behind them the symbol for ears. The wings, feet, and tail, inclosing a human face, are shown on the margin. The Haida as well as other coast Indians from Cape Flattery to Mount Saint Elias cover everything of use with totemic devices in painting and carving. Collected in Queen Charlotte Archipelago, by J. G. Swan. Museum number, 89033.

FIG. 15. Showing the conical shape of Fig. 14. This form should be compared with one seen so frequently in Chinese and Japanese hats. On the inside a cylindrical band of spruce root is stitched on so as to make the hat fit the wearer's head. A string passed under the chin is frequently added.



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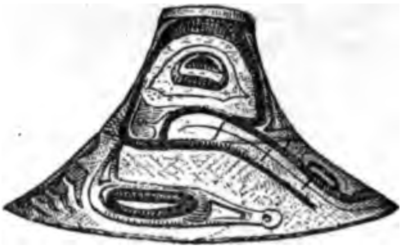

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FIG. 13. Haida twined basketry hat, top view. FIG. 15. Same hat, side view.

PLATE X.

(Mason. Basket-work.

FIG. 16. A portion $1\frac{1}{4}$ by 1 inch, taken from the rim of the last two figures. It shows the regular method of twined weaving, the introduction of the skip-stitch or twilled weaving into the greatest variety of geometric patterns, and the ingenious method of fastening off by a four-ply braid showing only on the outer side.

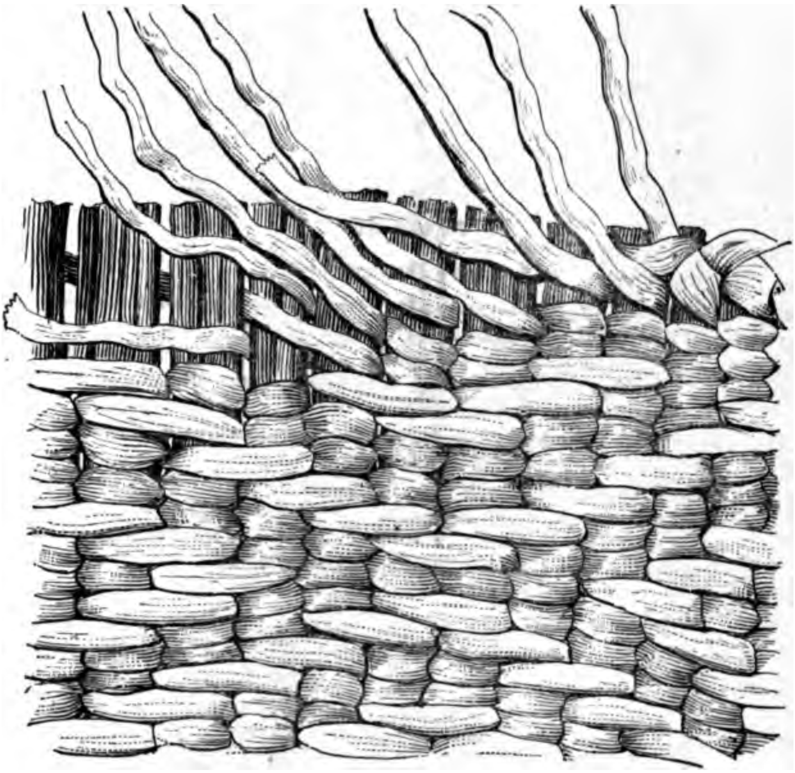

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FIG. 16. One and a half square inches of Fig. 14.

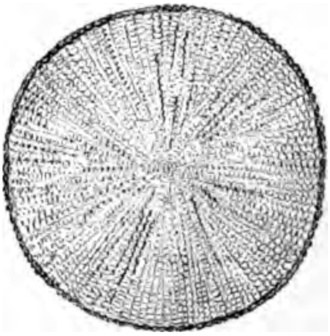
PLATE XI.

(Mason. Basket-work.)

FIGS. 17–19. Showing the Haida method of twined weaving, almost identical with that of the Thlinkit stock in style (Fig 11). Fig. 17 exhibits the method of mounting the work. Along the side of the upright pole is seen two bundles of spruce-root splints ready for use, one black, the other in natural color.

FIG. 18. The bottom of the basket, with radiating warp, twined weft, and an external twine on its outer boundary.

FIG. 19. One square inch of Fig. 17, indicating the exceedingly regular method of the twining. On the upper margin is seen the external row of twining added after the fabric was finished. Collected from the Massett tribe of Haidas, Queen Charlotte Islands. Museum number, 88956.



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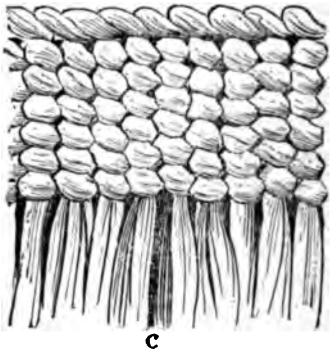

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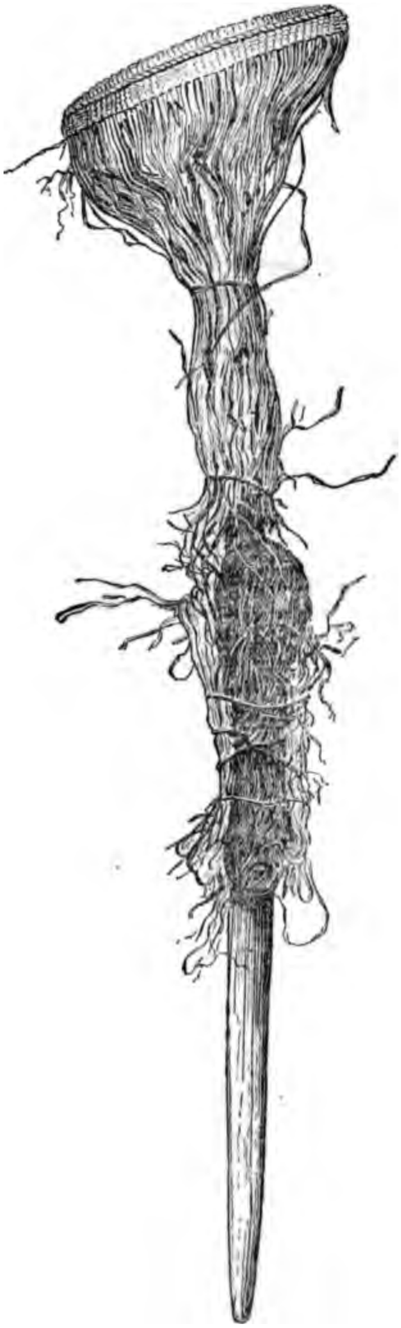
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FIG. 17. Haida basket set up.
FIG. 18. Bottom of same.

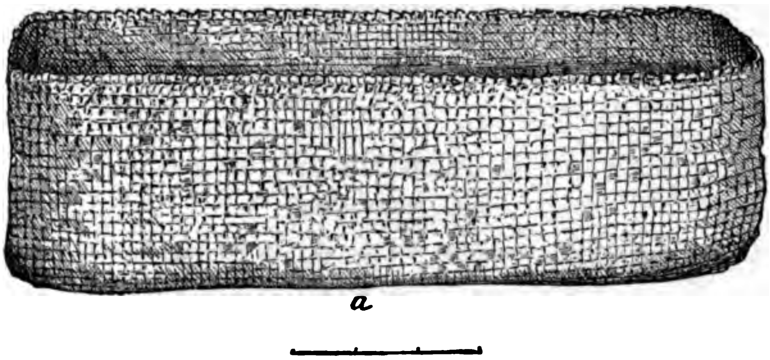
FIG. 19. One square inch of the side.

PLATE XII.

(Mason. Basket-work.)

Fig. 20. Showing regularly woven cedar-bark wallet of Bilhoolas. The bottom and sides are all in checker pattern. By an endless variety in real and proportional width of warp and weft thread, and by coloring some of the threads, an infinite number of patterns is produced. The fastening off is done as in Fig. 12. In many cedar-bark baskets of this region the two sets of threads run diagonally, producing a diamond rather than a checker pattern. Again, much more rarely three elements are involved, an open-work of two sets running diagonally, and a horizontal thread running through the open rhombs, in and out, as in multitudes of Japanese baskets. Collected in British Columbia, by James G. Swan.

Fig. 21. One square inch of Fig. 20, natural size.



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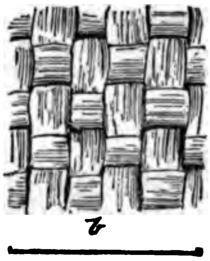


21

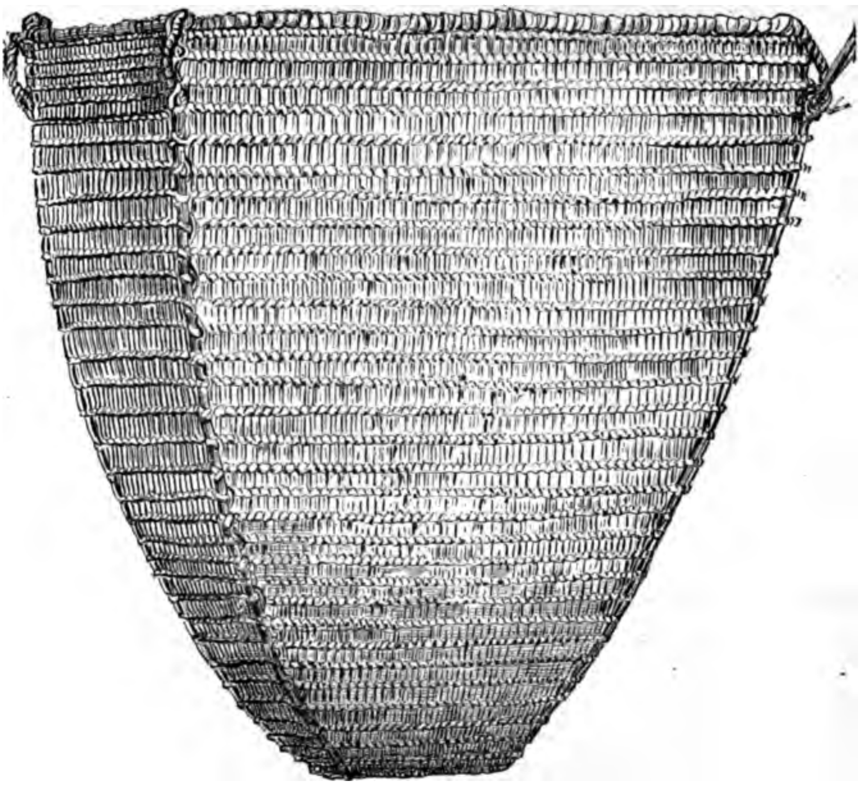
FIG. 20. Bilhoola woven cedar bast basket.
FIG. 21. One square inch of Fig. 20.

PLATE XIII.

(Mason. Basket-work.)

FIG. 22. Openwork carrying basket of the bird-cage or fish-trap style of weaving made by the Clallam Indians (Selish stock). The frame-work is a rectangle of large twigs from the corners of which depend four twigs, joining as shown in the figure. To this frame-work are lashed smaller rods running horizontally and vertically, making a lattice-work with any desirable size of meshes. Finally, spruce-root splints are coiled around the crossings of these lattice rods. In this particular example the coiling is not continuously around the basket, but on each side separately in boustrophedon, but in the pretty Makah baskets, woven in this style, the coiled thread continues around without break from the beginning to the end of the work. The handles for the attachment of the head-strap are loops of spruce-root cord set on at the corners. Collected in Washington Territory, by J. G. Swan. Museum number, 23480.

FIG. 23. Showing the exact method administration in this form of basketry. It should be closely studied with reference to Makah basketry and Congo shields and baskets.



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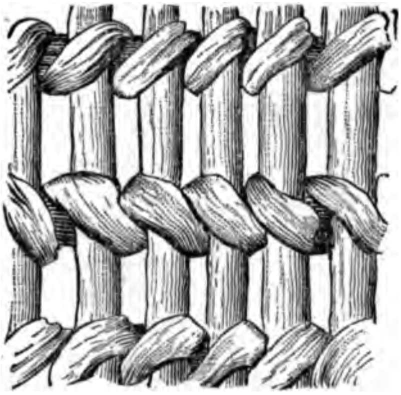


b

23

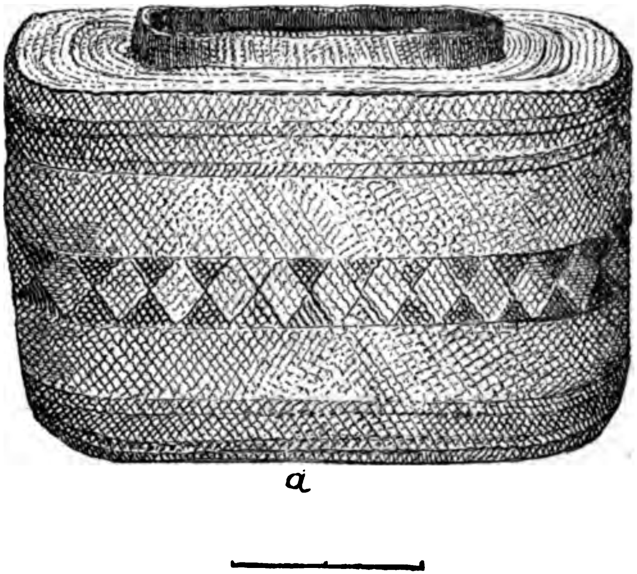
FIG. 22. Carrying basket of Clallam Indians.
FIG. 23. One square inch of Fig. 22, enlarged to show bird-cage stitch.

PLATE XIV.

(Mason. Basket-work.)

FIGS. 24-26. A wonderful specimen of basketry from the Makah Indians (Nutkan stock). It includes the three distinct types, the plain checker weaving of the Bilhoolas (Fig. 26, bottom), the twined pattern frequently mentioned in this paper, and, lastly, the bird-cage pattern of the Clallams (Fig. 25). The ornamentation on this class of baskets, as on the commercial baskets of the Haidas, consists of geometric patterns in black, yellow, drab, reds, blues, &c., colors many of which are obtained from traders. The straws are dyed and the pattern is alike on both sides. Collected at Cape Flattery, by James G. Swan, in 1876. Museum number, 23346.

PLATE XIV.



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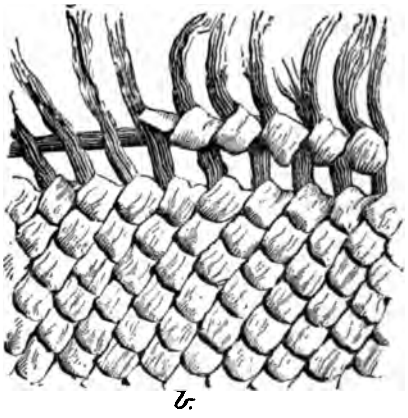

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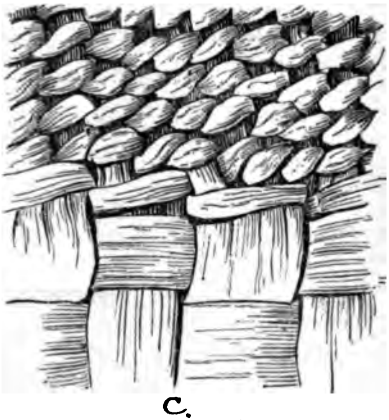


26

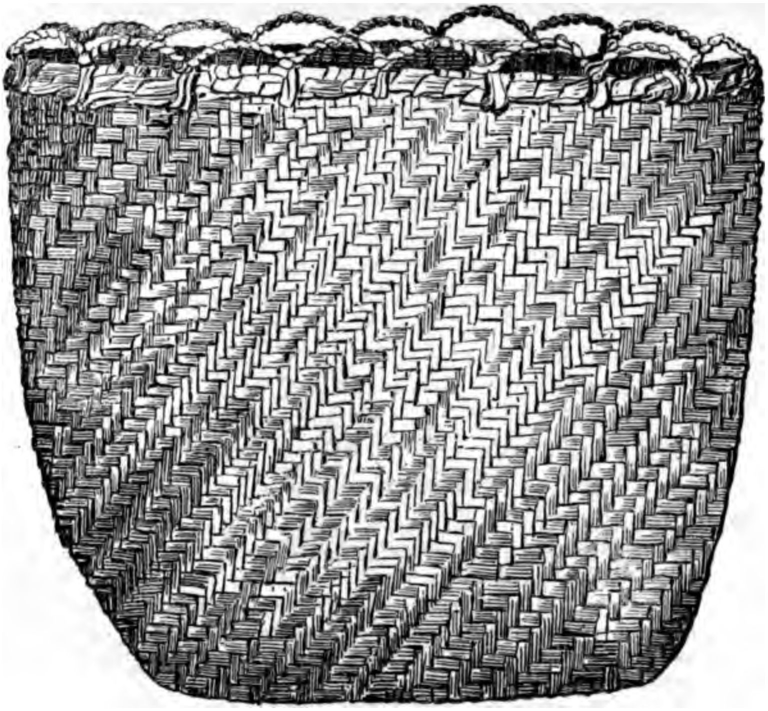
FIG. 24. Makah bird-cage pattern in basketry.
FIG. 25. One square inch of Fig. 24, on the side.
FIG. 26. One square inch outer edge of bottom.

PLATE XV.

(Mason. Basket-work.)

FIG. 27. Twilled splint basket of the Clallams (Selish stock), made of white birch wood. The bottom was woven first and all of the bottom splints became the warp of the sides, which are built up by weaving weft splints. The twilled effect is produced by passing each weft splint always over two warp splints, and by carrying two weft splints around at the same time, making them overlap alternate warp splints. The fastening off is done by bending down the warp straws and whipping them in place with splint. The scallop on the edge is formed by looping the middle of two splints under the rim, twisting both pairs of ends into a twine, passing one twine through the other, and then doubling down to repeat process for the next scallop. Collected in Washington Territory, by James G. Swan. Museum number, 23509.

FIG. 28. One square inch of Fig. 27, showing the method of administering the splints in plain twill. Innumerable pleasing effects are produced by varying the color, number, width, and direction of the splints overlapping in the weaving.



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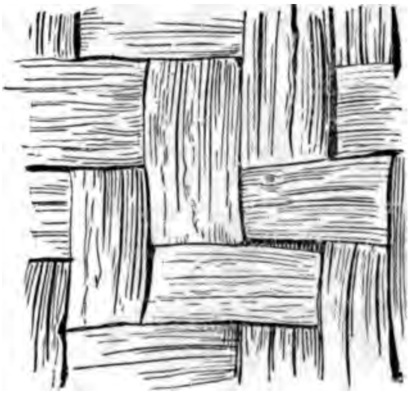


b

28

FIG. 27. Clallam twilled basket.
FIG. 28. One square inch on the side of 27.

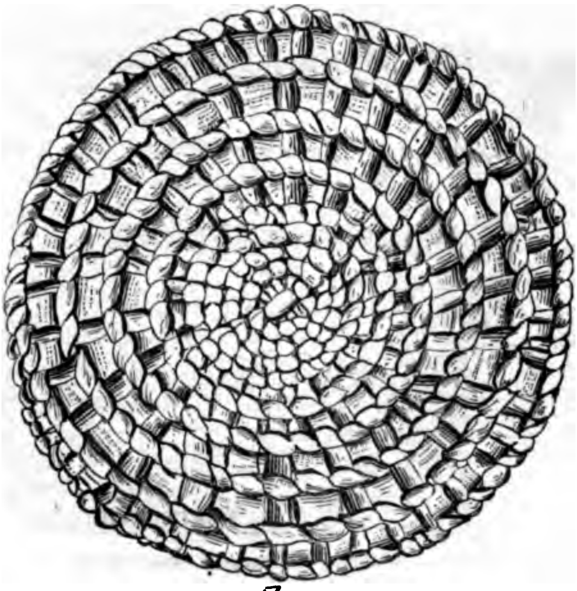
PLATE XVI.

(Mason. Basket-work.)

FIG. 29. Bottle covered with basket-work by Makah Indians. The groundwork is of bast and the ornamentation of red, yellow, and black straws sewed on singly after the Makah fashion. Great numbers of these covered bottles and other fanciful forms are prepared for sale by the Makahs as well as by the Haidas, whose work is similar in external appearance, but not in the method of weaving. Collected at Neeah Bay, Washington Territory, by James G. Swan, in 1884. Museum number, 73755.

FIG. 30. Bottom of Fig. 29, showing the radiated warp and the alternation of twined weft with the ordinary in-and-out weaving.

FIG. 31. Portion of the side of the bottle, showing the lattice arrangement of the warp, and the twined weft, producing irregular hexagons. This method of producing polygonal meshes, excepting the twined weft, is pursued in great variety and with excellent effect by the Japanese and other Oriental peoples.



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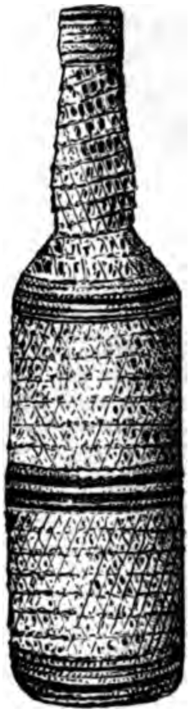

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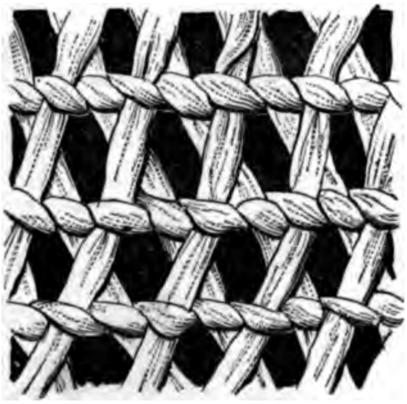


c

31

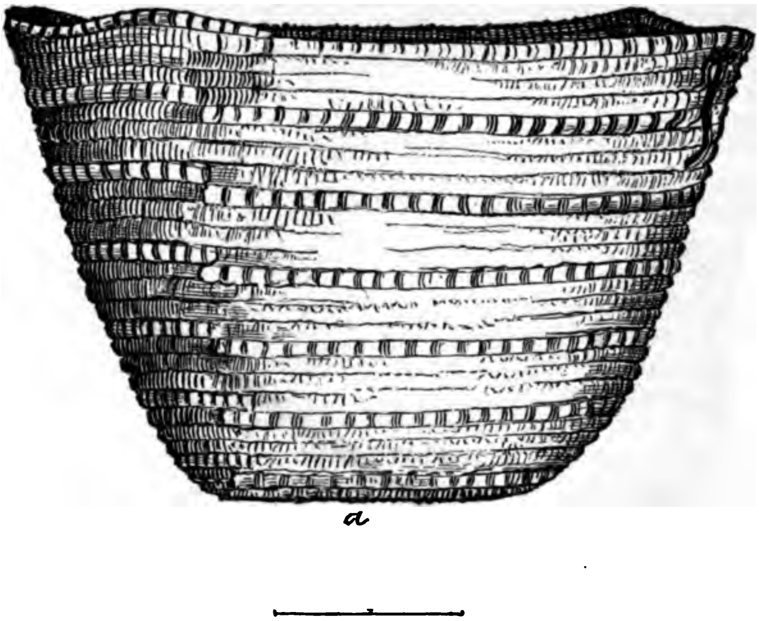
FIG. 29. Makah bottle covered with basketry, $\frac{1}{3}$.
FIG. 30. Bottom of bottle, natural size.
FIG. 31. One square inch from side of Fig. 29.

PLATE XVII.

(Mason. Basket-work.)

FIG. 32. Coiled basket, made of single osier coil, sewed down with spruce root or willow fiber, ascribed to Clallams by commerce in the text, but found on examination to have come from Sitka. The sewing is very regularly done, but the stitches split one another, as in Eskimo coiled sewing. Collected at Sitka, by J. G. Swan, in 1876. Museum number, 23512.

FIG. 33. One square inch of 32, showing the method of adding ornamental straws, caught by every third stitch. The appearance of the yellow dots on the dark-brown ground is very pleasing in the original.



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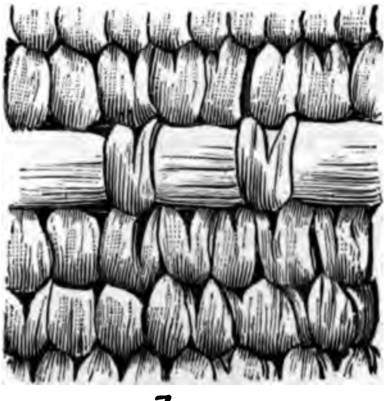


b

33

FIG. 32. Alaskan coiled basket. FIG. 33. One square inch of Fig. 32.

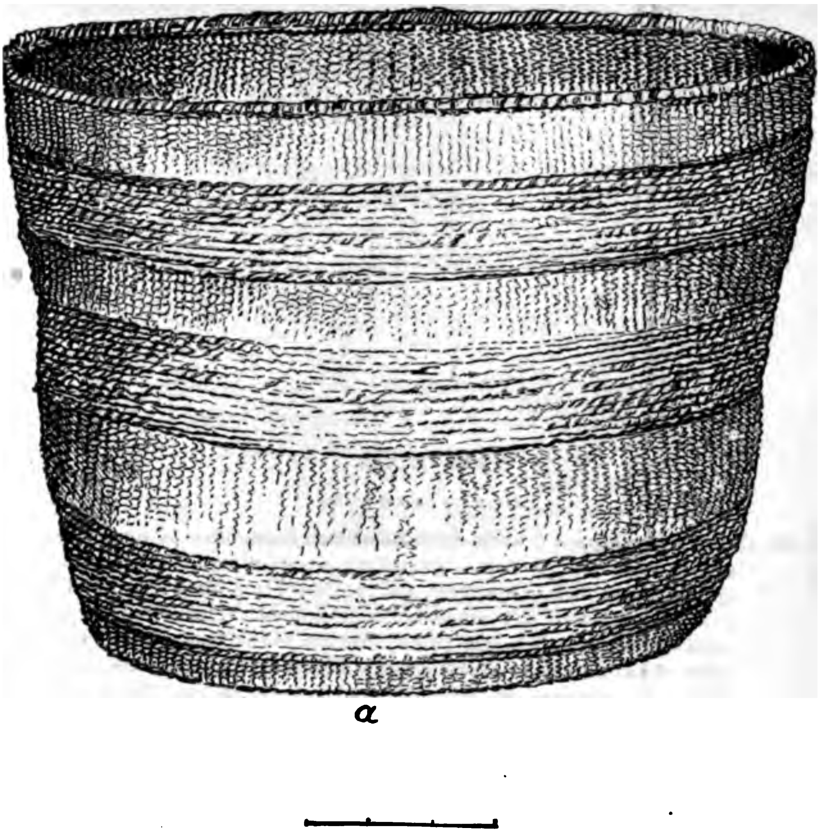
PLATE XVIII.

(Mason. Basket-work.)

FIG. 34. Twined or plaited flexible basket of the Klamath Indians, made of rushes and straw. The management of the material is precisely as in the Eskimo wallets (Fig. 3). The three elevated bands upon the outside are formed by rows of twine set on externally. The border in this case is formed by binding down the warp straws and sewing them fast with trader's twine. By twining a dark and a light colored straw, two dark or two light straws, and by varying the number of these monochrome or dichrome twines, very pleasing effects in endless variety are produced. Collected at Klamath Agency, in 1876, by L. S. Dyar. Museum number, 24124.

FIG. 35. One square inch of 34, showing the appearance of the body weaving above and of the ornamental twining below.

PLATE XVIII.



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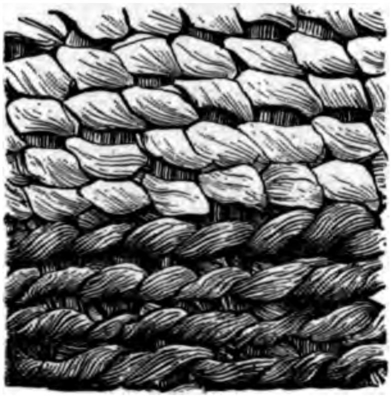


35

FIG. 34. Klamath twined basket.

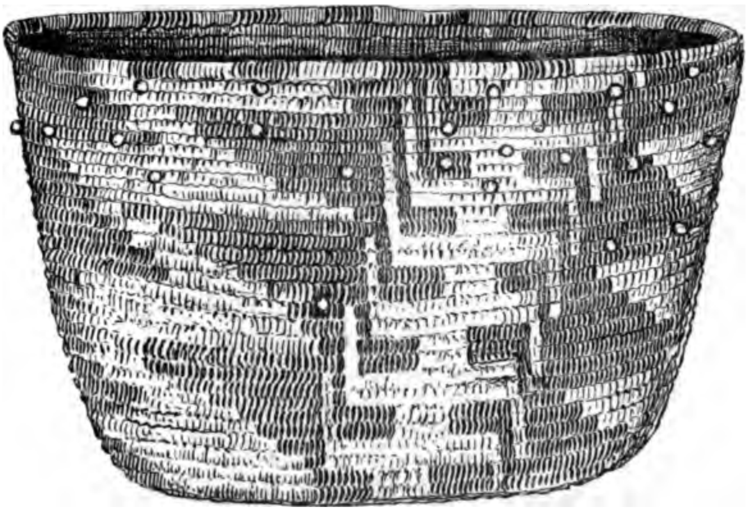
FIG. 35. One square inch of Fig. 34.

PLATE XIX.

(Mason. Basket-work.)

FIG. 36. Coiled and whipped baskets from Hoochnom tribe, made of some species of pliable root. The bottom is started upon a small flat Turk's-head knot of splint ¾ of an inch in diameter, and continued in a plane outward 4 inches in diameter before any ornament is attempted. The coils are ¼ inch in cross-section and there are twenty stitches to the inch. There are three pairs of the ornament on the exterior all alike. The harmony of geometric design produced by inverting the triangles on the alternate sides is much more expressive in the specimen where the brown-black ornament is in contrast with the dark wood color of the body. This specimen should be compared with Fig. 56. The patterns and designs in this ware are of great variety and beauty, and the use of beads and feathers much improves their appearance. Collected at Eel River, California, by Stephen Powers, in 1876. Museum number, 21371.

FIG. 37. One square inch of Fig. 36, showing method of coiling with various colored straws.



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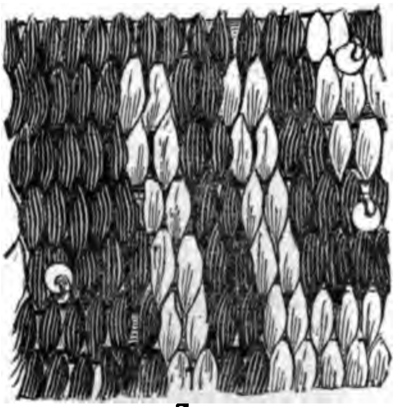

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37

FIG. 36. Hoochnom coiled basket.

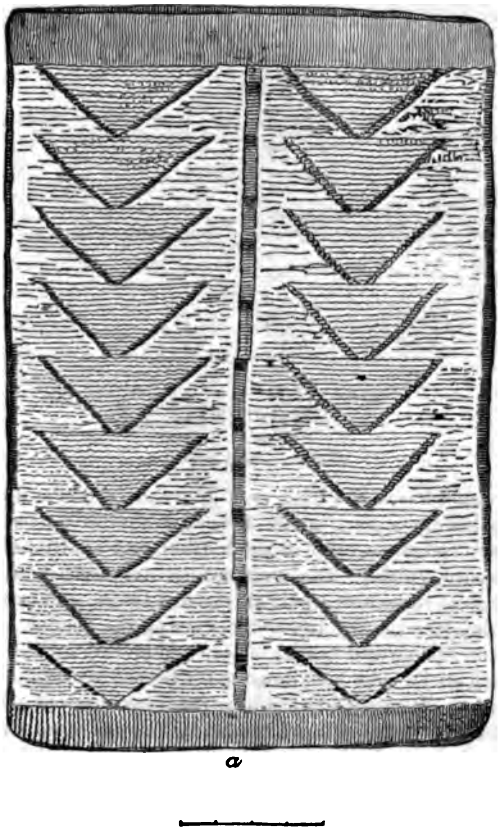
FIG. 37. One square inch of Fig. 36.

PLATE XX.

(Mason. Basket-work.)

FIG. 38. Twined wallet of Nez Percé Indians (Sahaptin stock) made of the bast of Indian hemp (*Apocynum cannabinum*). A sufficient number of warp strands were stretched and joined together in their middle by one row of twining. The ends of these warp strands were then brought together, and the weaver, by continuing the twine around and around, built up her bag. The ornamentation is the same old story of straw colored, brown, blue, and green strings of the Indian hemp twined externally. Collected in Idaho, by Rev. George Ainslee. Museum textile number, 8025.

FIG. 39. One square inch of Fig. 38, showing the body twining and the twined ornament above.



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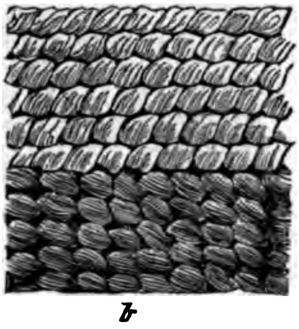


39

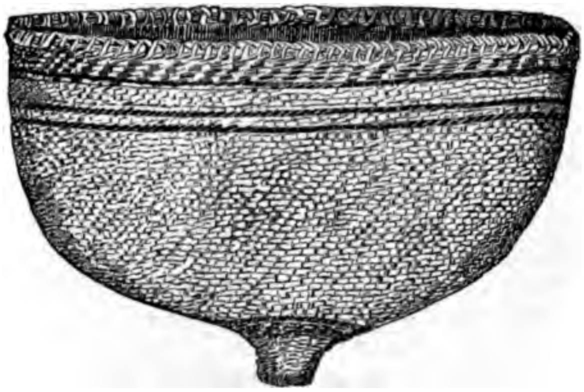
FIG. 38. Nez Percé twined wallet. FIG. 39. One square inch of Fig. 38.

PLATE XXI.

(Mason. Basket-work.)

FIG. 40. Twined basket hat of the Utes, used by women either as a hat or as a basket. The California women make hats of a similar pattern, but much finer. The warp twigs converge at the bottom and additional ones are added as the texture widens. The weft splints are carried around in pairs and twined so as to inclose a pair of vertical twigs, producing a twilled effect something like that of the softer ware of the Haidas and Clallams. The border of this twined basket is very ingeniously made. First, the projecting warp sticks were bent down and whipped with splints to form the body of the rim. Then with two splints the weaver sewed along the upper margin, catching these splints alternately into the warp straws below, giving the work the appearance of a button-hole stitch. The ornamentation is produced by means of dyed twigs either alone or combined with those of natural color. The texture of this ware is always coarse and rigid owing to the lack of good material in this arid region. Collected in Southern Utah, by J. W. Powell. Museum number, 11838.

FIG. 41. One square inch of Fig. 40, showing method of weaving and administering the colored splints.



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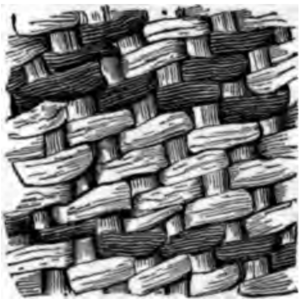


41

FIG. 40. Ute twined hat-bowl.

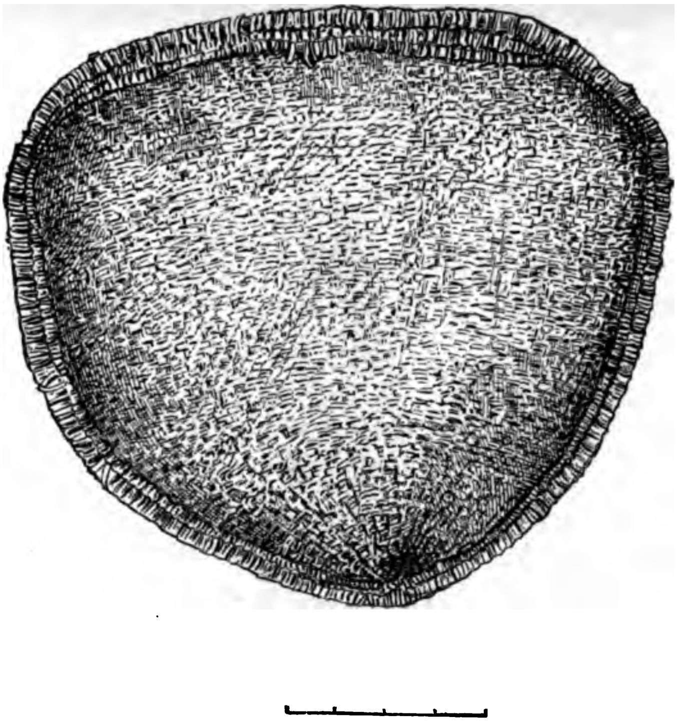
FIG. 41. One square inch of Fig. 40.

PLATE XXII.

(Mason. Basket-work.)

FIG. 42. Twined roasting-tray of the Pai Utes. The warp is a lot of osiers spread out like a fan. The weaving commenced at the bottom by short curves and progressed by ever-widening curves to the outer margin. The rim is made by a double row of the coiled and whipped work. The whole surface is very rough, as in all Ute work, by reason of not twisting the strands when making the twine. There is little ornamentation on this class of objects. Collected in Southern Utah, in 1874, by Maj. J. W. Powell. Museum number, 11857.

FIG. 43. Twined gathering and carrying basket of the Pai Utes. Woven precisely as the hats (Fig. 40) and the roasting-trays (Fig. 42). The splints are very fine, but their refractory nature makes all this ware coarse. Ornamentation is produced by external twining and by geometric patterns in dyed splints. Collected in Southern Utah, by J. W. Powell, in 1874. Museum number, 14667.



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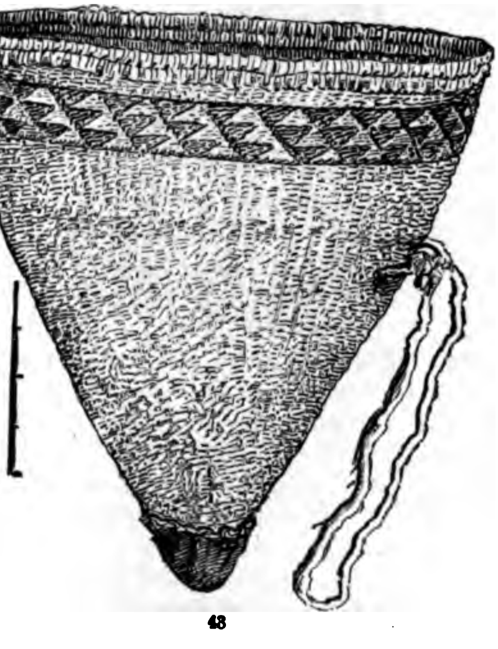


43

FIG. 42. Ute twined roasting tray.

FIG. 43. Ute carrying basket.

PLATE XXIII.

(Mason. Basket-work.)

FIG. 44. Harvesting wand of Pai Utes, made of twigs, split or whole, bound with yucca fiber. The figure represents the coarsest specimen in the collection. In most of this class the longitudinal twigs are held in place by rows of twine at long intervals. Collected in Southern Utah, in 1874, by J. W. Powell. Museum number, 11823.

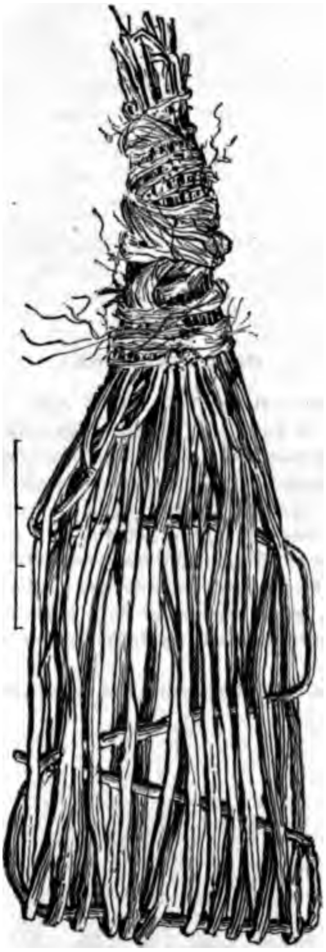


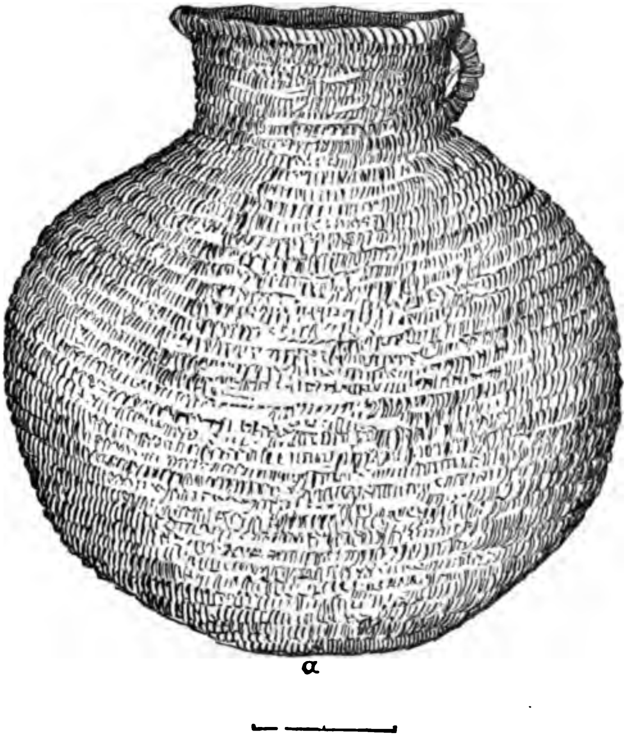
FIG. 44. Ute harvesting wand.

PLATE XXIV.

(Mason. Basket-work.)

FIG. 45. Coiled and pitched bottle of the Pai Utes, made of osier, by coiling the fundamental twigs in pairs and sewing with split osier always over the two in hand and between the twigs of the preceding round. As this bottle is to be covered with pitch either inside or out or on both sides, the sewing is left very open. By having one twig large and the other very small or by having a bunch of grass for the two twigs, a water tight joint is produced by the swelling of the warp and weft. The bungling manner of administering the stitches reminds one of the same type of ware among the Eskimo. A great variety of form is given to these pitched bottles. Collected in Southern Utah, by J. W. Powell, in 1874. Museum number, 11262.

FIG. 46. One square inch of Fig. 46, showing the use of the double-twig coil.



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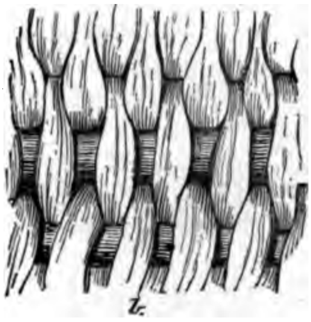


46

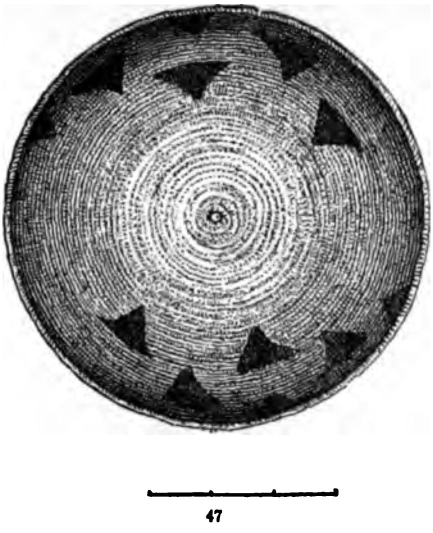
FIG. 45. Ute coiled and pitched water bottle.
FIG. 46. One square inch of Fig. 45.

PLATE XXV.

(Mason. Basket-work.)

FIG. 47. Small coiled mush bowl of the Pai Utes, made by coiling a splint and thin strip of yucca, bast, or osier, and whipping them with split osier. The sewing passes over the two elements of the coil in progress and through the upper element of the coil below, looping always under the subjacent stitches. Ornamentation produced by working into the fabric triangles with strips of martynia or dyed splints. The work is very regular and the texture water-tight, resembling the work of the Apaches and California Indians. The fastening off on the margin is very prettily done by whipping diagonally with two or three threads crossing one another. Collected in Southern Utah, by J. W. Powell, in 1874. Museum number, 14720.

FIG. 48. Coiled dish of Pai Utes. The work is founded upon a wooden plug in the center and coiled by means of an osier and a strip of fiber. Depth, 2¼ inches. The work is neatly done and the ornamentation resembles that of Fig. 47. Collected in Southern Utah, by J. W. Powell, in 1874. Museum number, 14719.



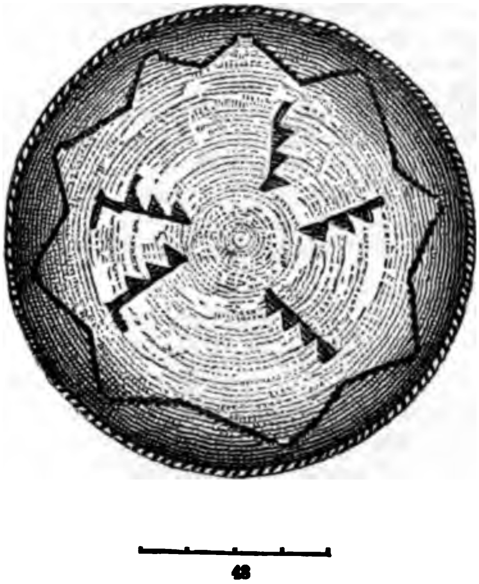


FIG. 47. Ute coiled mush bowl.

FIG. 48. Ute coiled mush bowl.

PLATE XXVI.

(Mason. Basket-work.)

FIG. 49. Water-tight basket bottle of the Apaches. The coiling consists of the rigid osier and soft fiber combination, before mentioned, the latter acting as chinking or calking of the openings. This ware differs essentially from that of the Utes in the glossy even stitches, the care taken in passing them uniformly under the elements of the preceding coil, and the more elaborate shapes and ornamentation. The lines dropped from the bottom of the chevron at the bottom meet in a black spot at the center. The upper chevron and the rings of the neck are in black, red, and yellow splints, alternately. Collected in Arizona, by Dr. J. B. White, U. S. A., in 1875. Museum number, 21494.

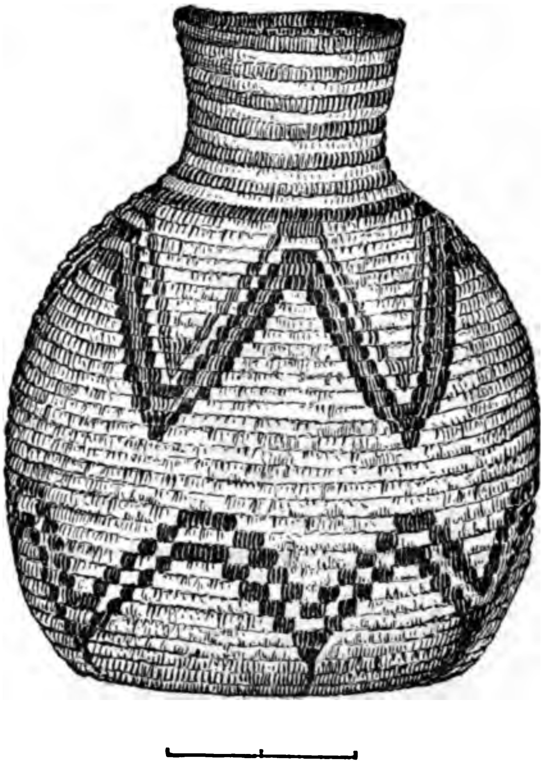


FIG. 49. Apache coiled basket bottle.

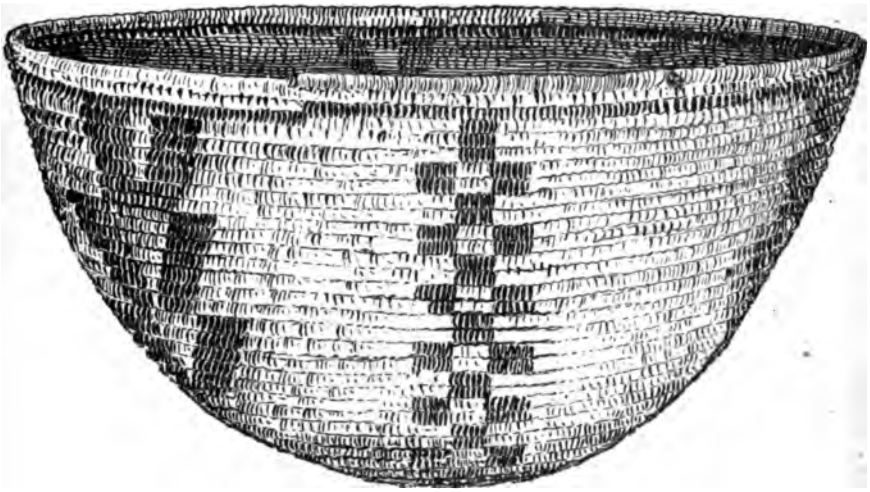
PLATE XXVII.

(Mason. Basket-work.)

Fig. 50. Coiled basket bowl of the Coahuila Apaches. The coil is a bundle of yucca or other fiber, and the sewing is done with splints of different natural color, resembling reed cane, and with others dyed a beautiful chestnut and black. The lovely cloudy effects produced by the ingenious use of splints of different natural colors resemble those on the Moqui sacred bread trays. The fastening off is simple coil sewing. The ornamentation is a series of crosses arranged vertically, and four series of rhomboids inclosing triangles. Collected in Southern California, by Dr. Edward Palmer. Museum number, 21787.

Fig. 51. One inch of Fig. 50, showing the multiple coil and the method of stitching.

PLATE XXVII.



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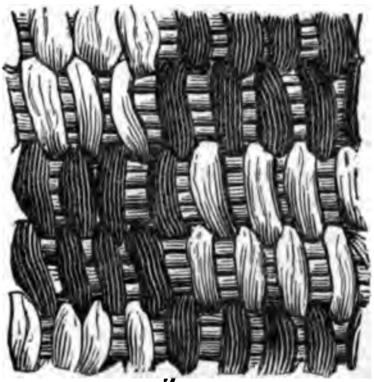

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51

FIG. 50. Apache coiled basket-bowl.

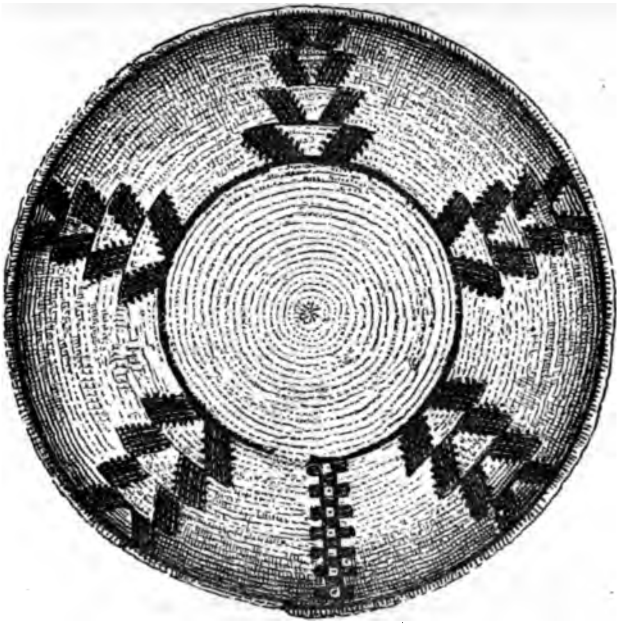
FIG. 51. One square inch of Fig. 50.

PLATE XXVIII.

(Mason. Basket-work.)

FIG. 52. Inside view of Fig. 50. The black line at the bottom, nearly continuous, incloses a circle in uniform unvarnished color. All the body color above this line is of a shining yellow, varying in shade. The disposition of the ornament is better shown in this figure.

FIG. 53. A similar Coahuila Apache basket, in which the shading of the body material is in places very dark. The zigzag ornament, effected by the administration of the triangle, is very attractive. Depth, 5¼ inches; width, 16 inches. Collected by Dr. Edward Palmer, in Southern California. Museum number, 21786.



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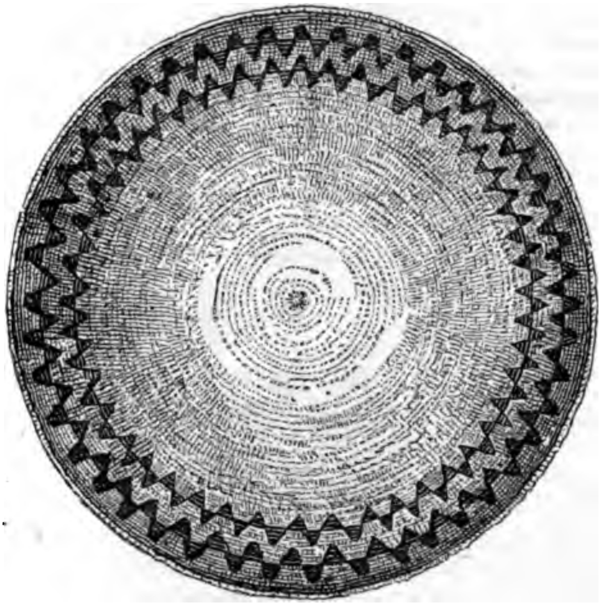

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FIG. 52. Inside view of Fig 50.

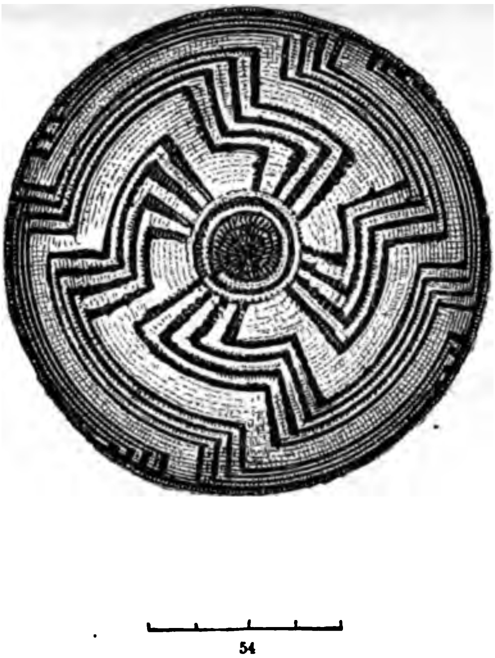
FIG. 53. Coahuila Apache basket-bowl.

PLATE XXIX.

(Mason. Basket-work.)

FIG. 54. Coiled osier basket bowl of the Apaches, inside view, made upon a single twig. The apparently unsystematic ornament is indeed very regular. Four lines of black sewing of different lengths proceed from a black ring of the center. From the ends of all these lines sewing is carried to the left in regular curves. Then the four radiating lines are repeated, and the curved lines, until the border is reached. Depth, 4 inches. Collected in Arizona, by Dr. J. B. White. Museum number, 21493.

FIG. 55. Coiled osier basket bowl of the Garotero Apaches, inside view. In every respect this resembles the foregoing. The inclosed triangles alternating with urn patterns constitute the ornamentation. Depth, 3¼ inches. Collected on Gila River, by Rev. H. W. Read. Museum number, 4428.



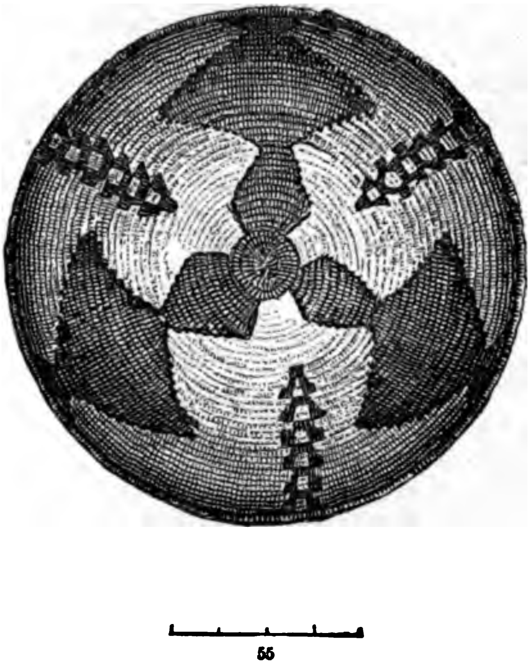


FIG. 54. Apache coiled basket-bowl. FIG. 55. Garotero coiled basket-bowl.

PLATE XXX.

(Mason. Basket-work.)

FIG. 56. Coiled basket bowl, made by Yokuts Indians, and here introduced for comparison with Apache work. This is by far the most elaborate piece of basketry in the National Museum. The bottom is plain and flat, bounded by a black line. The body color is that of pine root long exposed; the ornaments are in black, straw color, and brown. To understand this complex figure we must begin at the bottom, where 5 barred parallelograms surround the black ring, with center of brown, and generally four smaller bars of white and black alternating. By a series of steps or gradines this rectangular ornament is carried up to the dark line just below the rim. The spaces in the body color, at first plain, are occupied afterwards by open crosses, and finally by human figures. These human figures are excellent illustrations of the constraining and restraining power of material and environment in human achievement. There are 8 coils and 18 stitches to the inch. Figure, a truncated cone; width, 16½ inches; depth, 7½ inches. Collected in California, by Stephen Powers, in 1875.

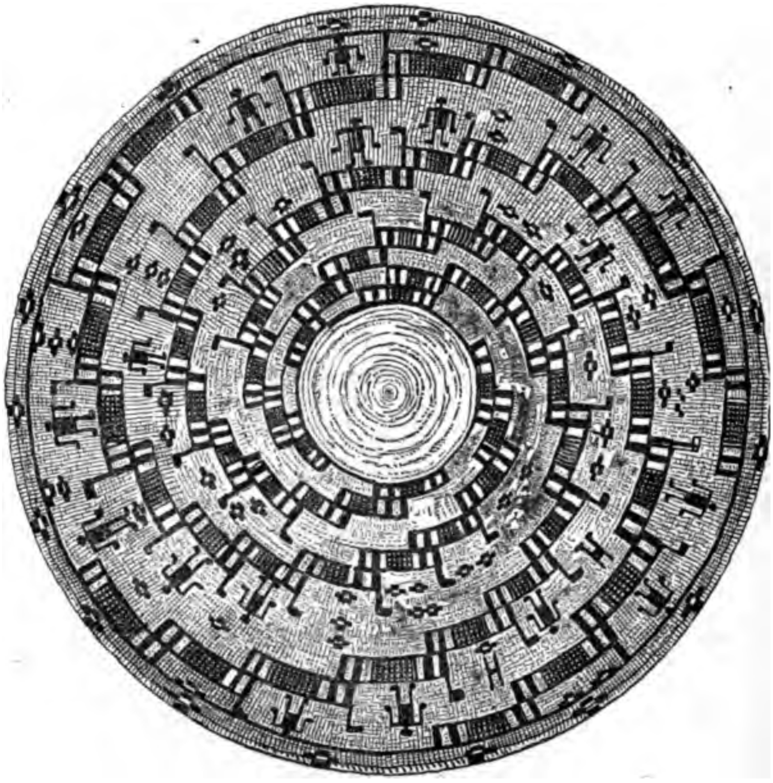


FIG. 56. Yokut Indian coiled basket-bowl.

PLATE XXXI.

(Mason. Basket-work.)

FIG. 57. Coiled basket bowl of the Navajos, with single osier in the coil. Body color natural hue of the wood; ornaments in mahogany-brown, and black. The bowl is divided four quadrants, each separated by a black border and having a cross in the center. The border is very interesting, resembling the braiding on a whip. It is made by sewing with a single splint as follows: The splint is passed under the sewing of the last coil and then drawn over it and backward. It is then passed under again, upward and forward, just in advance of the starting point. Thus, by sewing forward and backward, as one coils a kite string, a braided effect is produced by a single splint thread. Width, 16¼ inches; depth, 4½ inches. Collected in New Mexico, in 1873, by Governor Arny. Museum number, 16510.

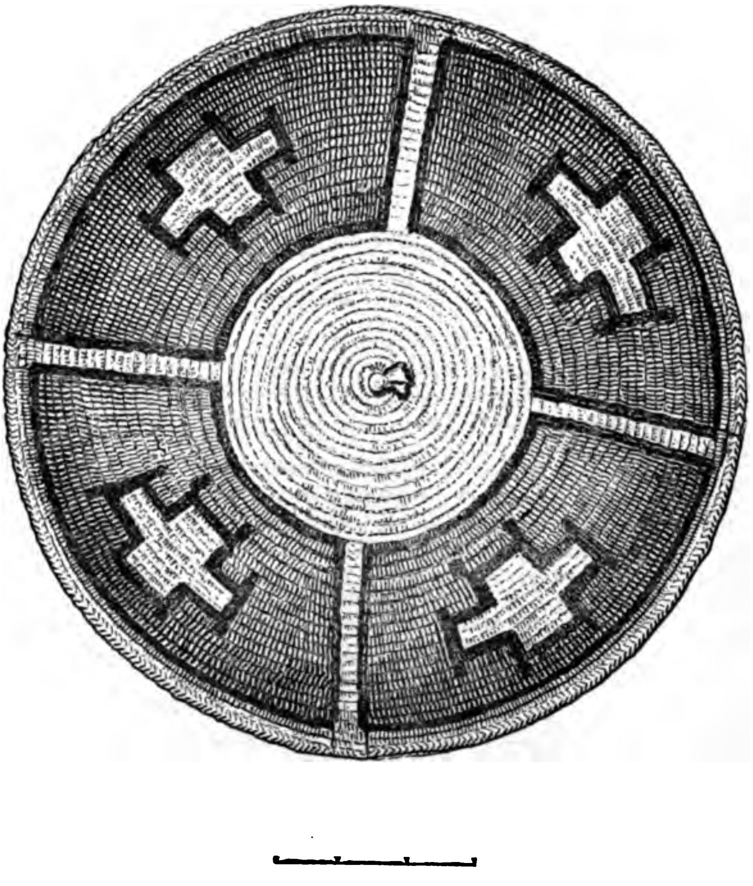


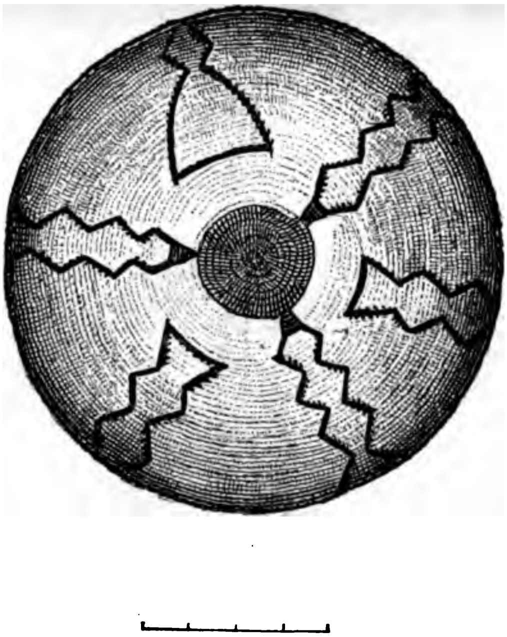
FIG. 57. Navajo coiled basket-bowl.

PLATE XXXII.

(Mason. Basket-work.)

FIG. 58. Coiled basket bowl of the Pimas, made up on a foundation of yucca, the sewing done with splints of willow or pine. The rude character of the ornament is worthy of notice. Depth, 4 inches. Collected by Dr. Edward Palmer, in Arizona. Museum number, 5548.

FIG. 59. Coiled basket bowl of the Pimas, similar in structure to 58. The grecque ornament is wrought in with tolerable symmetry. The border has the braided appearance before mentioned, given by forward and backward sewing along the border with a single splint. In this instance the stitch passes backward three stitches of the sewing each time. This is truly the most ingenious and effective work of the kind yet seen. Collected by Mrs. Georgia Stout, Pima Agency, Arizona. Museum number, 27837.



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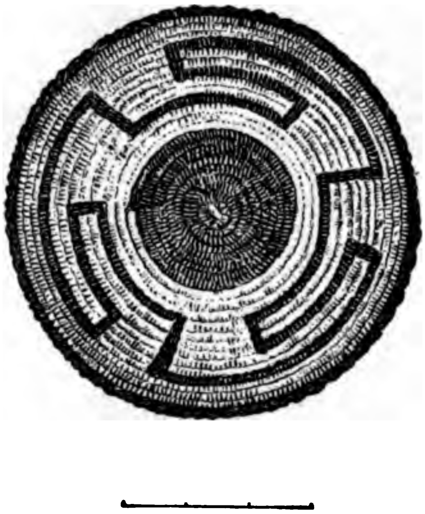


59

FIG. 58. Pimo coiled basket-bowl.

FIG. 59. Pimo coiled basket-bowl.

PLATE XXXIV.

(Mason. Basket-work.)

FIG. 61. Coiled basket bowl of Pimos. Made on yucca with splint sewing similar to those just described. The ornament is evidently the work of a beginner, but the pattern is both regular and unique, all the parts being in threes and the two sides of each pattern quite symmetrical. Border of backward and forward sewing, quite uniform in appearance, but done regardless of the number of body stitches beneath. Width, 8 inches; depth, 2¼ inches. Collected in Arizona, by Dr. Edward Palmer, in 1884. Museum number, 76039.

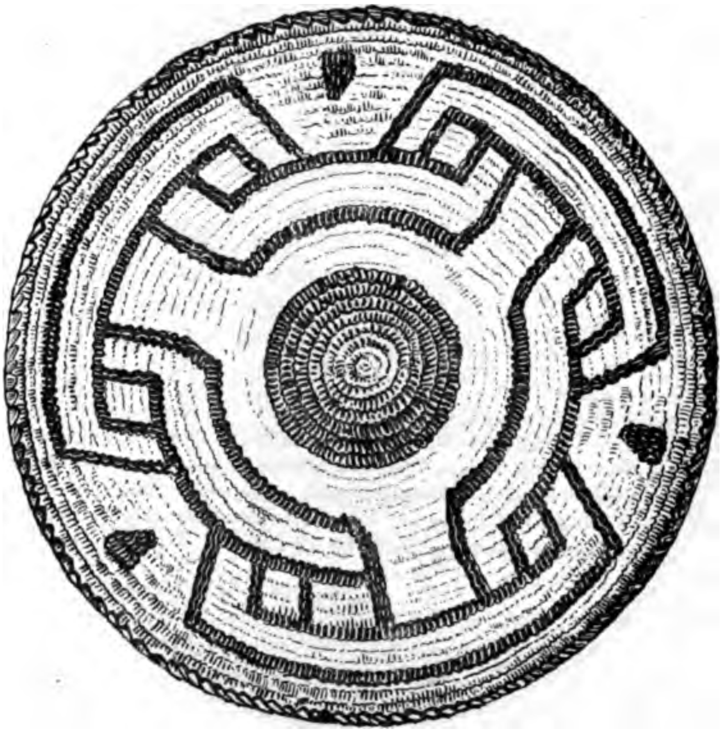


FIG. 61. Pimo coiled basket-bowl.

PLATE XXXV.

(Mason. Basket-work.)

FIG. 62. Coiled basket bowl of Pimos, flat-bottomed. The ornament consists of four similar patterns, based on four elongated right-angled triangles. Each of the other lines of the pattern is as nearly parallel to one of the sides of this triangle as the texture will permit. It is difficult to conceive how this design was studied out beforehand. Width, 12¼ inches; height, 5 inches. Collected in Arizona, in 1884, by Dr. E. Palmer. Museum number, 76040.

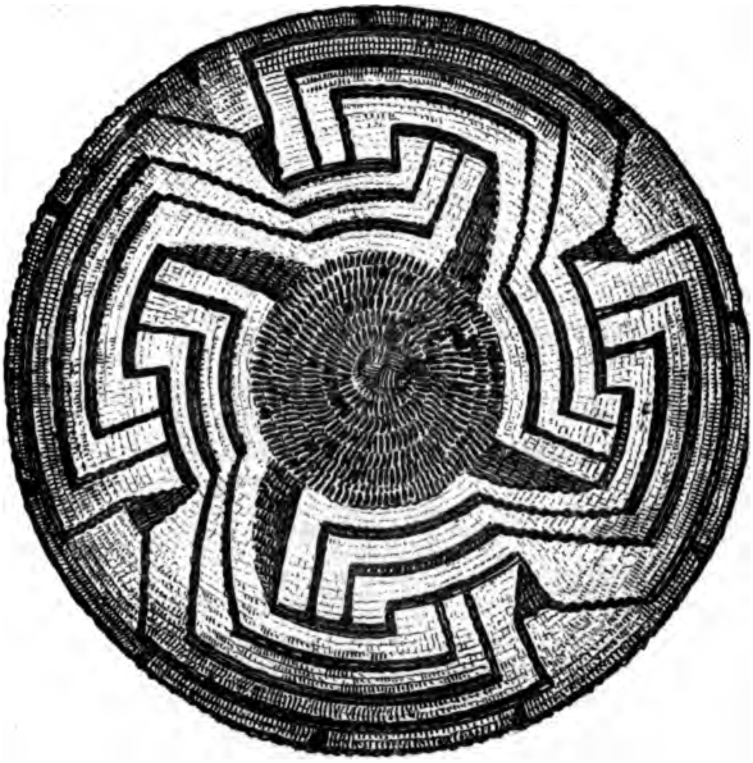


FIG. 62. Pimo coiled basket-bowl.

PLATE XXXVI.

(Mason. Basket-work.)

FIG. 63. Large basket bowl of Pimos. The manufacture is similar to that in those just mentioned, but the use of the continuous fret in ornamentation is remarkable, as exhibiting the easy manner in which the fret may have arisen in basketry. The border is a false braid formed by a single splint and resembles an elongated guilloche. Width, 18¾; depth, 5½. Collected in Arizona, by Dr. E. Palmer, in 1874. Museum number, 76041.

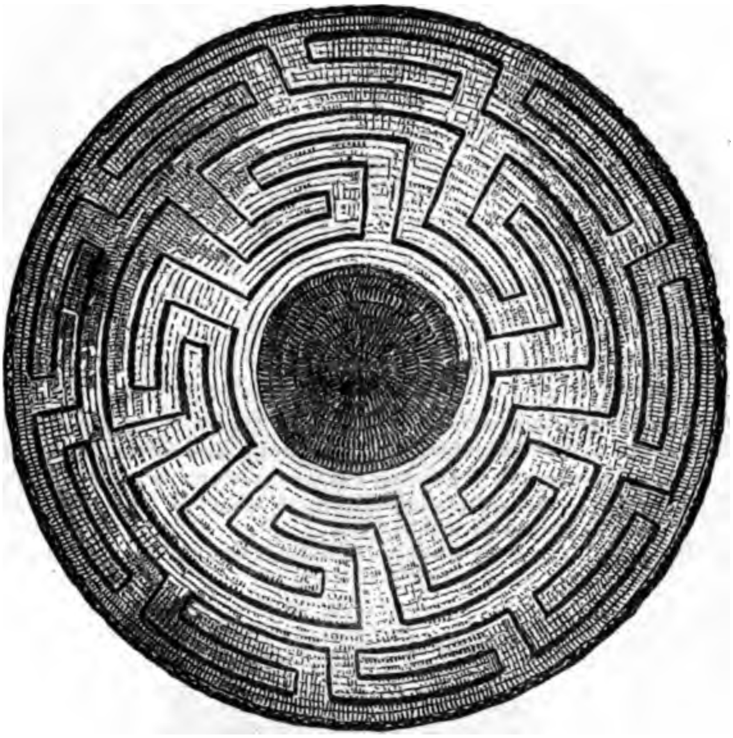


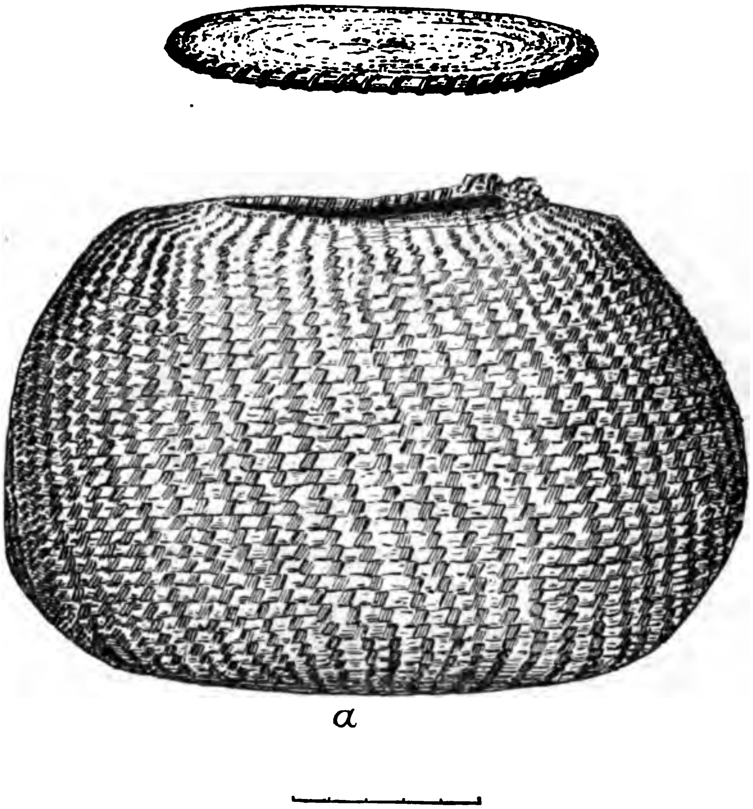
FIG. 63. Pimo coiled basket-bowl.

PLATE XXXVII.

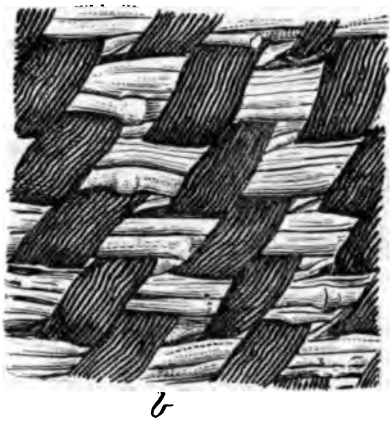
(**Mason.** Basket-work.)

FIG. 64. Small twined granary of straw, made by Pimos. Made of wheat-straw in a coil sewed with bands of willow-bark. The very noticeable feature about this specimen is that only in a few cases do the stitches of the coils interlock. Diameter, 20 inches; height, 12 inches. Collected in Arizona, by Dr. E. Palmer, in 1884.

FIG. 65. One square inch of 64, showing the coiled straws and the method of sewing.



64



65

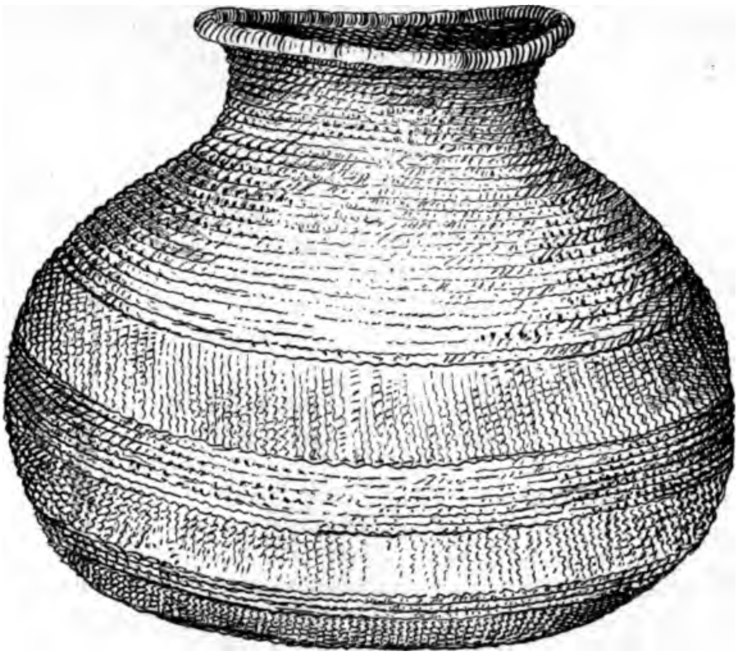
FIG. 64. Pimo coiled granary of straw and bark.
FIG. 65. One square inch of Fig. 64.

PLATE XXXVIII.

(Mason. Basket-work.)

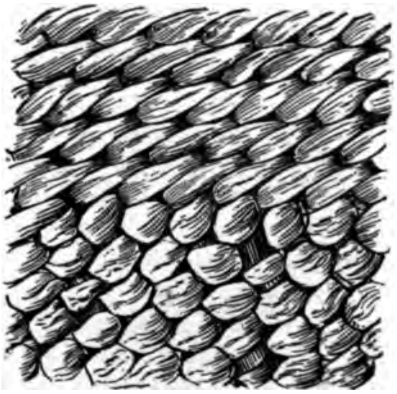
FIG. 66. Twined jar-shaped basket of the Mokis. Excepting in the rigid material and the pottery form, we have here all the details of the west coast basketry. At the center of the bottom each twining includes two warp twigs; the next round the same plan is followed, but the stitches alternate. This for 10 rows; on the fifth is an exterior twining for ornament. Then succeed 6 rows of twining on each twig, then 4 rows of twining over two twigs, then 9 rows of single twining overlaid by two double rows of external twining. The rest of the surface is covered with twining over every warp twig, onoverlaid the upper portion and at the bulge by external twining. The fastening off is mere whipping. Collected in Moki pueblos in Arizona, by J. W. Powell, in 1884.

FIG. 67. One inch of 66, showing the twining on single and on double rods.



a

66



b

67

FIG. 66. Moki twined basket-jar.

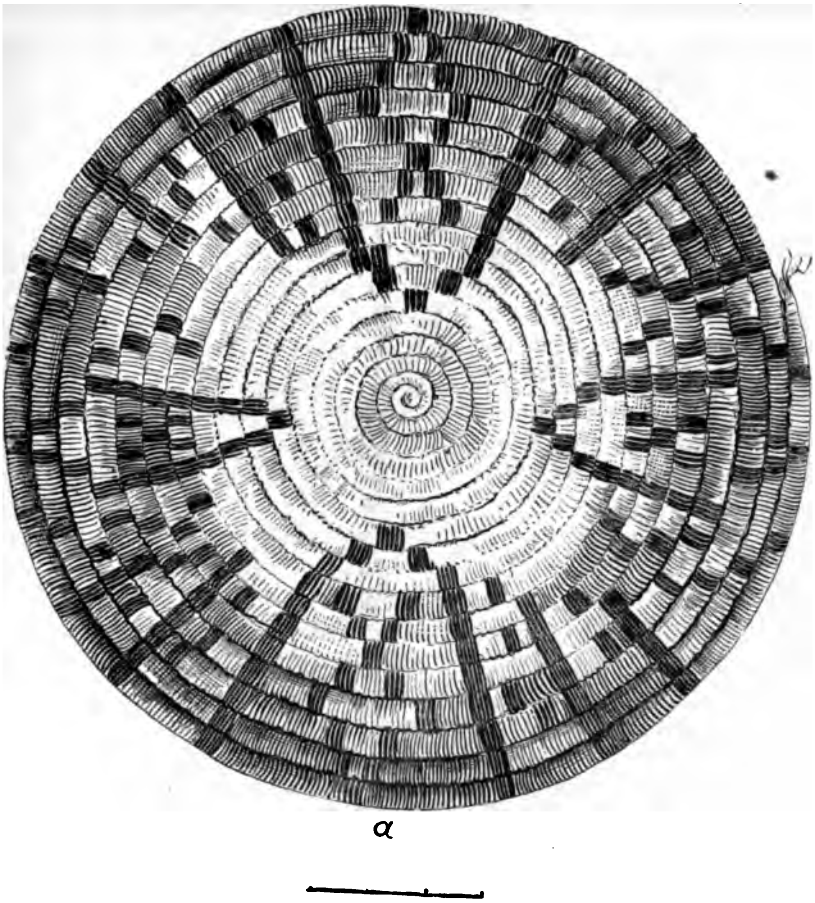
FIG. 67. One square inch of Fig. 66.

PLATE XXXIX.

(Mason. Basket-work.)

FIG. 68. Coiled sacred meal tray of the Mokis. A bunch of yucca leaf stems, or of grass, varying from ½ inch to 1 inch in diameter, is sewed in a continuous coil by means of slender threads of yucca fiber about $\frac{1}{16}$th inch in width, and very uniform throughout. Each stitch of the progressing coil is caught into a stitch of the coil beneath with perfect regularity, forming a dish looking like a great worm coiled up. The ornamentation is in yellow and brown. The first spots interiorly contain from 4 to 6 stitches. On the next turn a series is arranged with relation to these. By the simple management of this device hundreds of patterns are worked out. Collected in Arizona by J. W. Powell.

FIG. 69. One square inch of Fig. 68, showing the method of administration.



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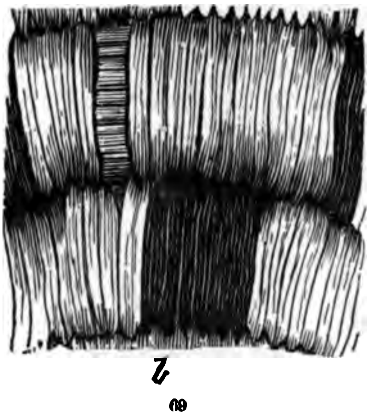


69

FIG. 68. Moki coiled tray.

FIG. 69. One square inch of Fig. 68.

PLATE XL.

(Mason. Basket-work.)

FIG. 70. Coiled sacred meal tray of the Mokis. The coloring of the interior exhibits the fine shading produced by the skillful manipulation of the dark and the light side of the fiber. Collected in Arizona, by J. W. Powell.

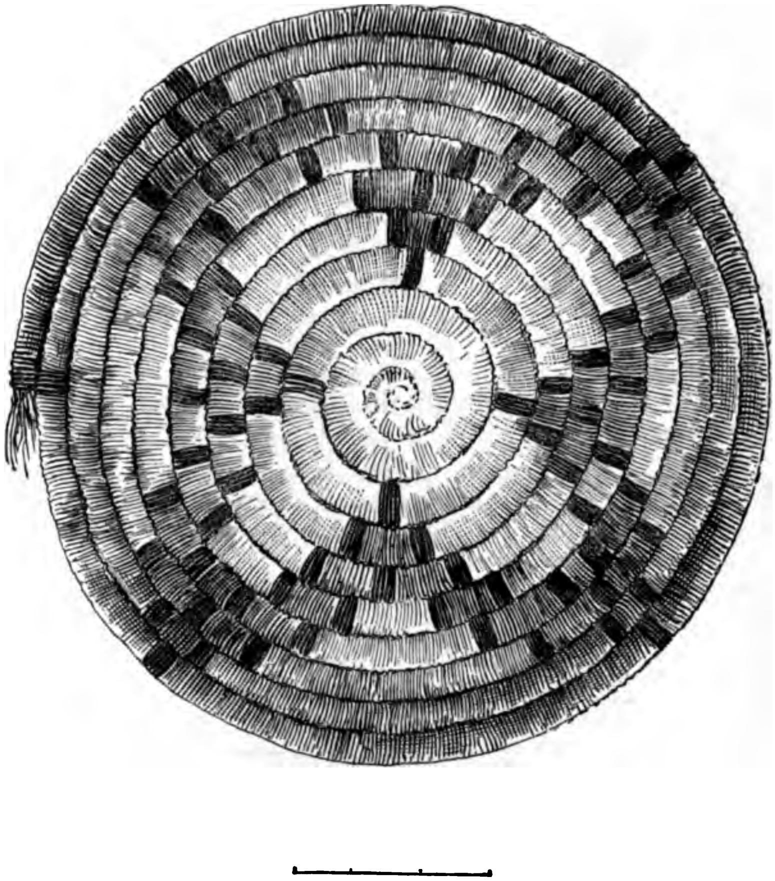


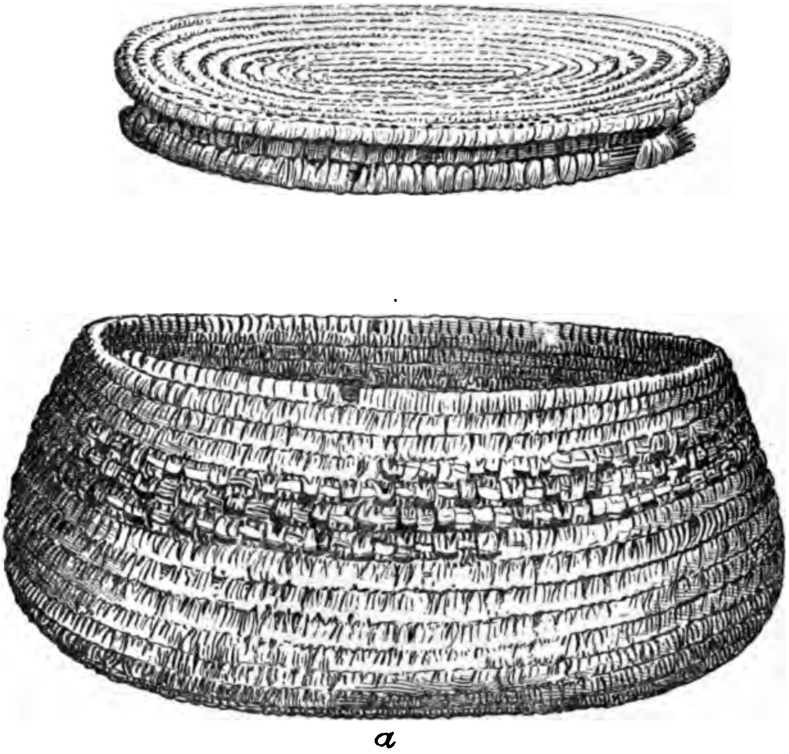
FIG. 70. Moki coiled tray.

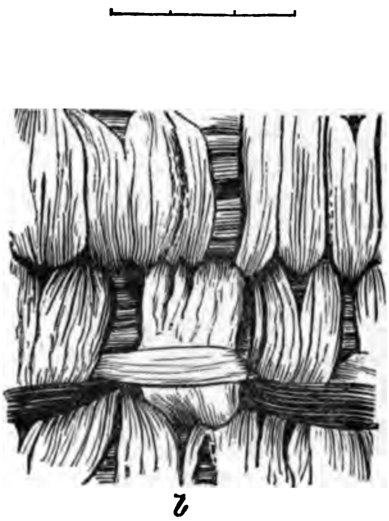
PLATE XLI.

(Mason. Basket-work.)

FIG. 71. Coiled basket of Upper Egypt, made of bundles of palm-leaf veins, sewed with strips of palm leaf. Introduced here for comparison with the Moki work. Ornamentation in red and black. A long red or black strip of leaf is laid on the outside of a coil and caught down by alternate stitches. The varying of the number of stitches caught over or covered by these strips produces a multitude of effects. These baskets are frequently pitched for boats or Moses' arks. Collected by Dr. G. W. Samson, in Upper Egypt, 1848. Museum number, 74871.

FIG. 72. One square inch of Fig. 71, showing the sewing and the strips of ornament.





72

FIG. 71. Nubian coiled basket.

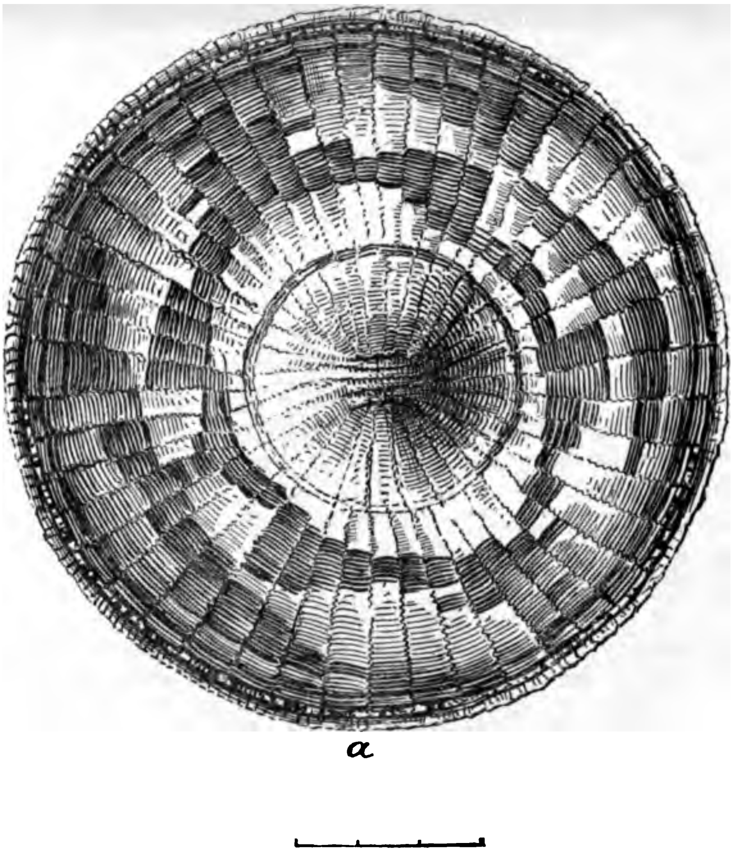
FIG. 72. One square inch of Fig. 71.

PLATE XLII.

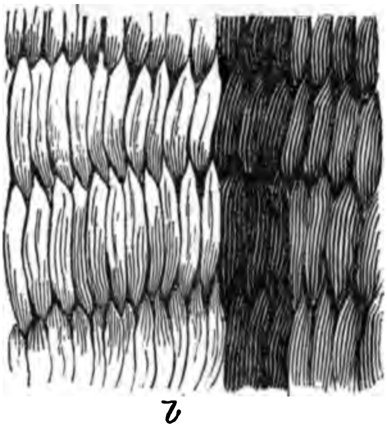
(Mason. Basket-work.)

FIG. 73. Woven bread-tray of the Mokis, made upon radiating warp twigs by weaving bits of colored twig, stripped of their bark, in and out, and by fastening off the ends alongside of the warp twigs inside the fabric. This type should be particularly noticed as the first example yet encountered of the regular basket weaving so common in the ware of more civilized peoples. Some of the bits of twig used are less than an inch long, and none of them ever exceed a foot. The figure is the same on both sides, but each stitch and design in front is just one space farther to the right on the back. Collected in Arizona, by J. W. Powell, in 1874.

FIG. 74. One square inch of Fig. 73, showing the regularity and disposition of the weaving.



73



74

FIG. 73. Moki woven bread-tray.

FIG. 74. One square inch of Fig. 73.

PLATE XLIII.

(Mason. Basket-work.)

FIG. 75. Woven bread-tray of the Mokis, similar in workmanship to Fig. 73. The fastening off is done by whipping one or two twigs around the edge by means of yucca fiber. The design is a series of concentric rings in pretty colors, the figures corresponding exactly on the two sides. Collected in Arizona, by J. W. Powell, 1874.

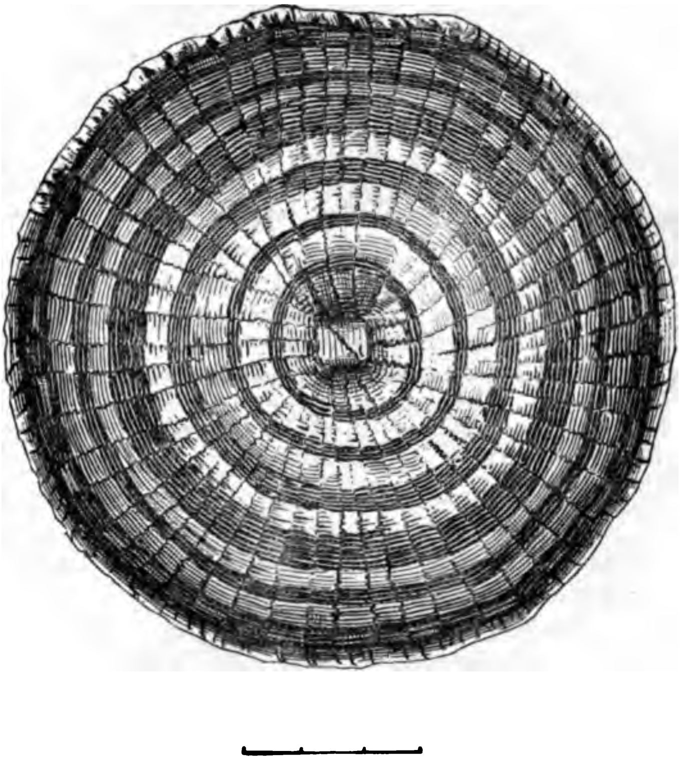


FIG. 75. Moki woven bread-tray.

PLATE XLIV.

(Mason. Basket-work.)

FIG. 76. Woven basket-tray of the Mokis. This figure shows very clearly what pleasing designs may be worked out by the skillful adjustment of simple forms and color. In the bright colors used for this ware the Mokis produce decidedly brilliant effects. Collected in Arizona, by J. W. Powell, in 1874.

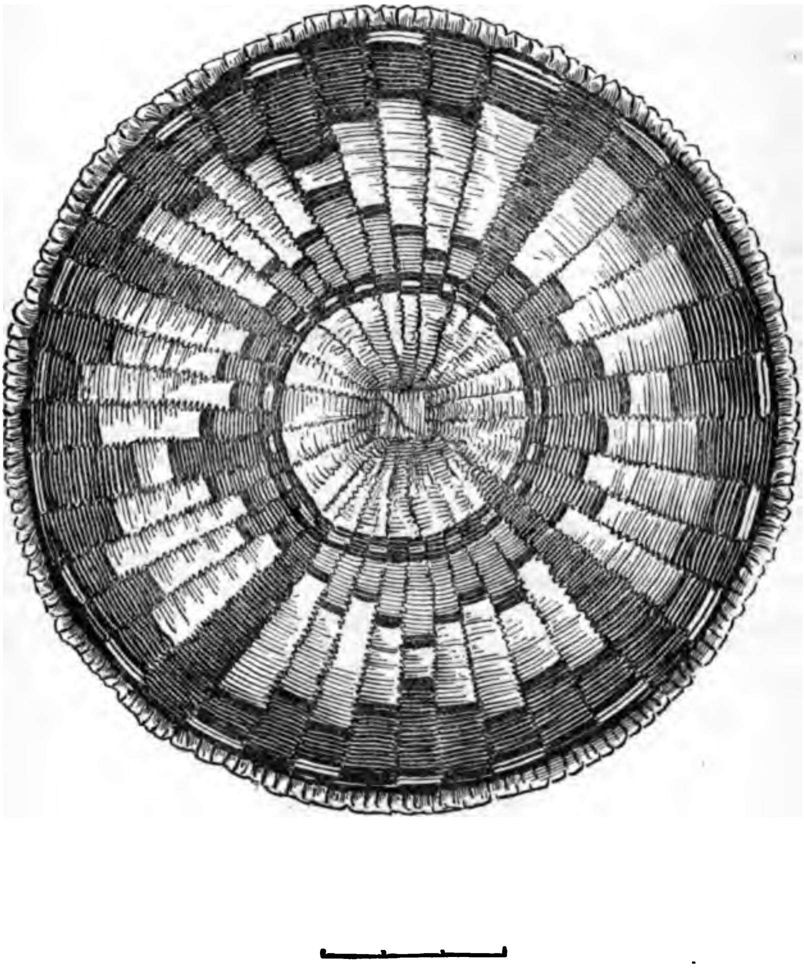


FIG. 76. Moki woven bread-tray.

PLATE XLV.

(Mason. Basket-work.)

FIG. 77. Woven basket-tray of the Mokis. In this figure should be noticed the method of starting the weaving. A certain number of twigs are plaited at the center into a cross. These twigs are spread out so as to form the radii of a circle, and the little twigs are so woven as to increase the length of the meshes going outward. Here and there an additional warp twig is introduced at points where they are needed, but not beyond the dark circle. The ornamentation in this case is produced simply by the use of patches, two or three stitches of the same color alternating with the body color. Collected in Arizona, by J. W. Powell, in 1874.

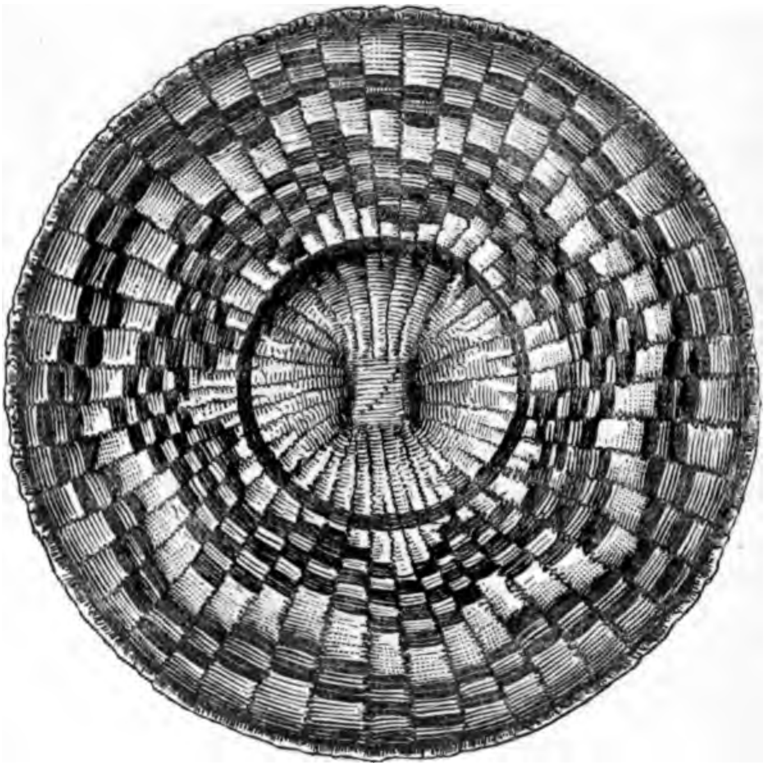


FIG. 77. Moki woven bread-tray.

PLATE XLVI.

(Mason. Basket-work.)

FIG. 78. Woven basket-tray of the Mokis. The especial attraction about this specimen is the genuine cloud effects produced on the surface by the simplest means. This represents a stage of art far above the genius of savage culture. Collected in Arizona, by J. W. Powell, in 1874.

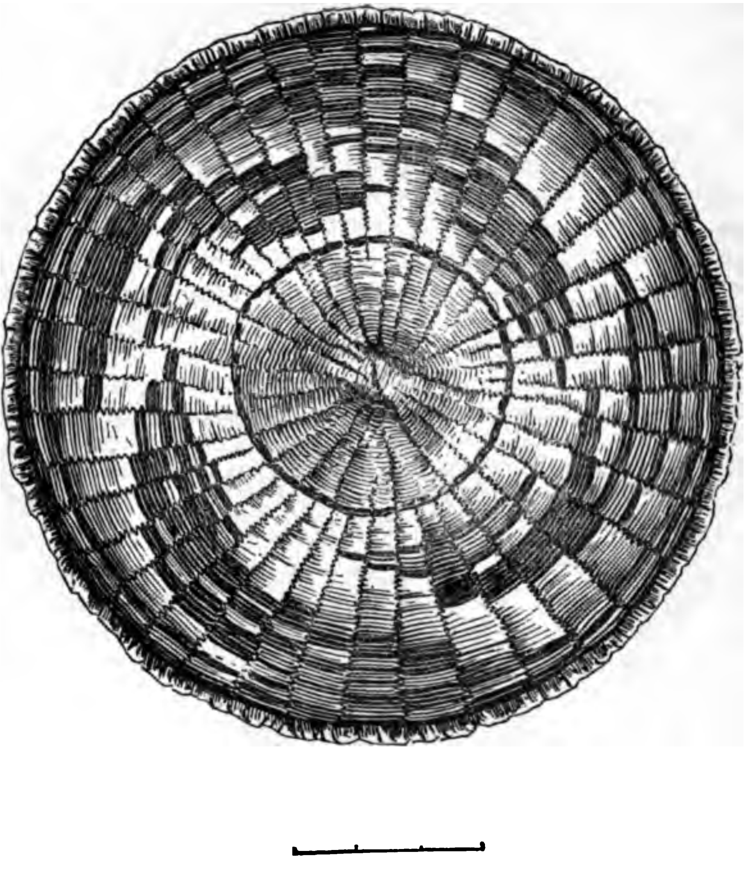


Fig. 78. Moki woven bread-tray.

PLATE XLVII.

(Mason. Basket-work.)

FIG. 79. Woven basket-tray of the Mokis, made as others just described. The very insecure method of fastening off is shown on the left rim. The pattern on this specimen introduces no new elements or colors. The elaborate human head, with brilliant cape and gorgeous head-dress, reminds one of Aztec inscriptions. Collected in Arizona, by J. W. Powell, 1874.

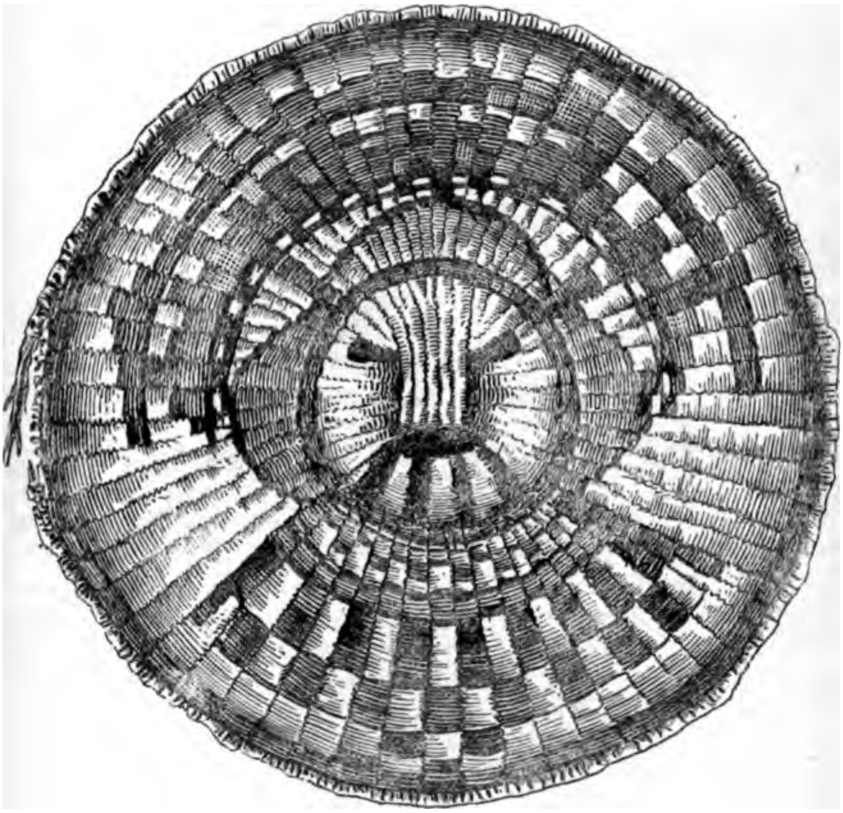


Fig. 79. Moki woven bread-tray.

PLATE XLVIII.

(Mason. Basket-work.)

FIG. 80. Woven peach-basket of the Zuñis. More than the Moki trays, this specimen recalls the method of manufacture to be seen in the thousands of baskets employed in civilized drudgery. Roughness, asymmetry, rude fastening off with yucca fiber are its attractions. Collected in New Mexico, by J. W. Powell. Museum number, 40291.

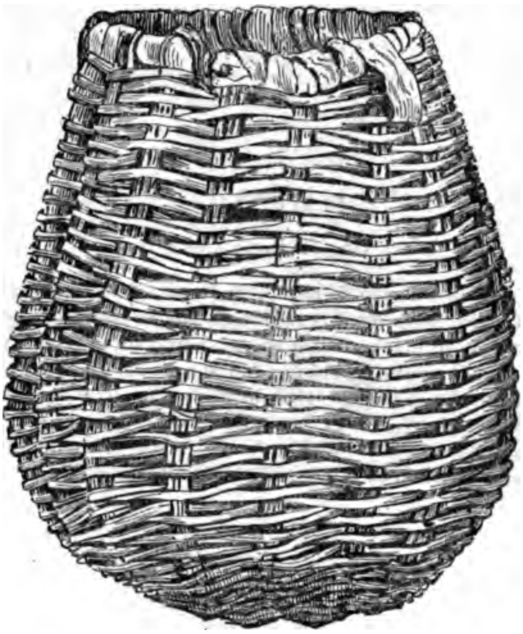


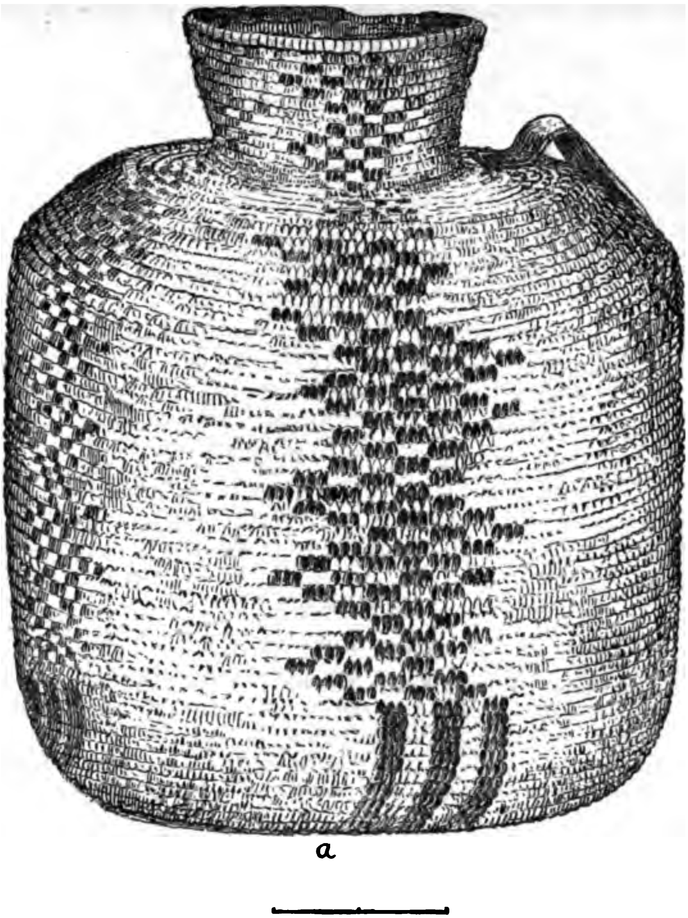
FIG. 80. Zuñi woven fruit-basket,

PLATE XLIX.

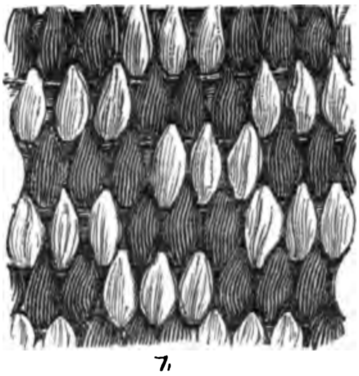
(Mason. Basket-work.)

FIG. 81. Jar-shaped coiled basket from Zuñi Indians. This is a very beautiful specimen of coiled ware for this region, in shape, regularity of stitch, and ornamentation in black. Upon the authority of explorers the text is made to say that the pottery-making Indians are not good basket-makers. This specimen looks as though it might have come from California. Collected in New Mexico by J. W. Powell, in 1874.

FIG. 82. One square inch of 81, showing the use of the strip of fiber for chinking, and the alternation of white and black stitches.



81



82

FIG. 81. Zuñi coiled basket-jar.

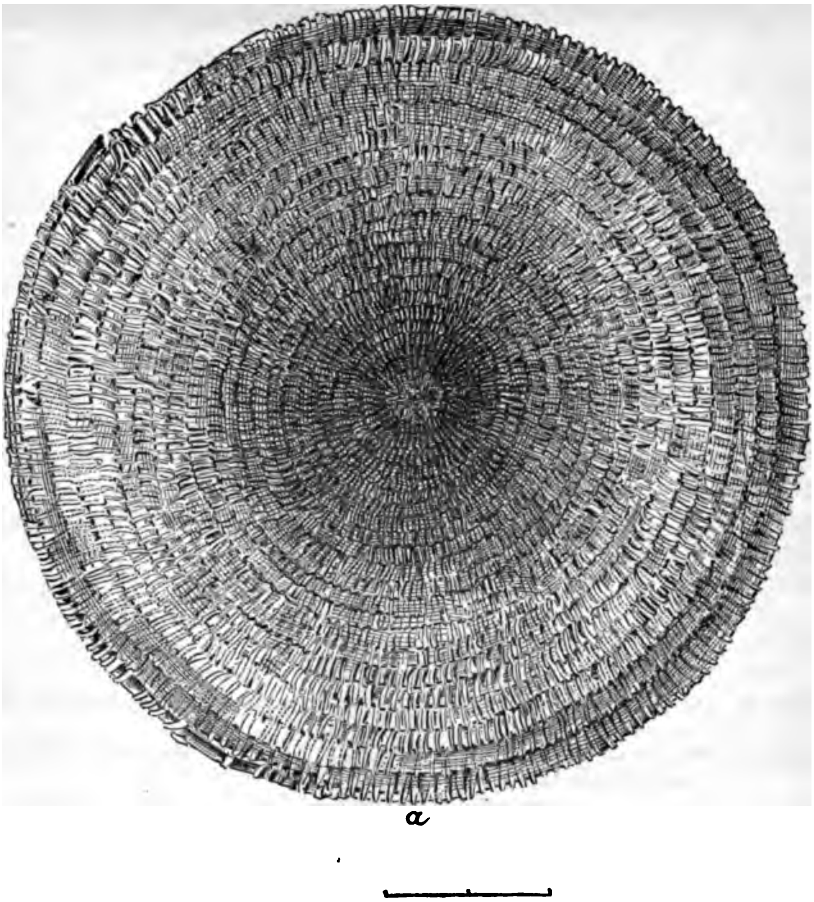
FIG. 82. One square inch of Fig. 81.

PLATE L.

(Mason. Basket-work.)

FIG. 83. Coiled basket-tray from Zuñi. The texture is exceedingly open, owing to the use of the single rod in the coil with coarse chinking. Collected in New Mexico, by J. W. Powell, in 1874.

FIG. 84. One square inch of Fig. 83, showing the warp rods and the method of sewing. This stitch is best employed in the exquisite rattan baskets of Siam.



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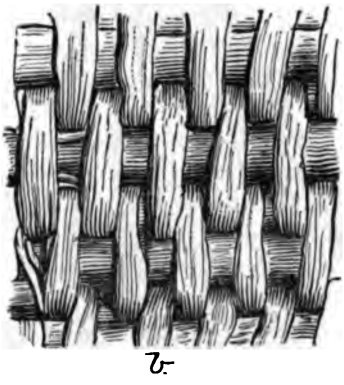


84

FIG. 83. Zuñi coiled food-tray.

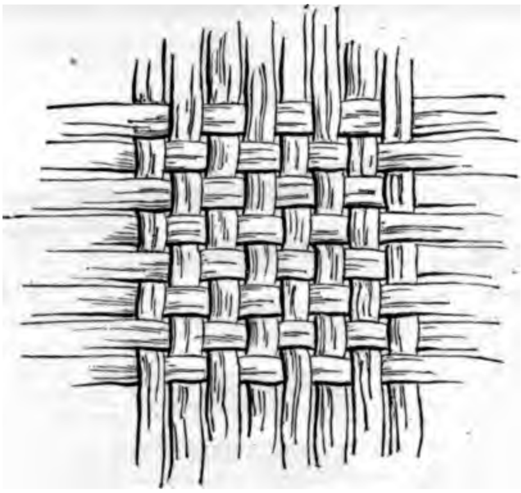
FIG. 84. One square inch of Fig. 83.

PLATE LI.

(Mason. Basket-work.)

FIG. 85. The first step in ordinary basket-weaving, showing how the bottom is set up in split cane or splints of tough wood.

FIG. 86. The second step in basket-weaving, showing how the bottom splints are turned up to form the sides.



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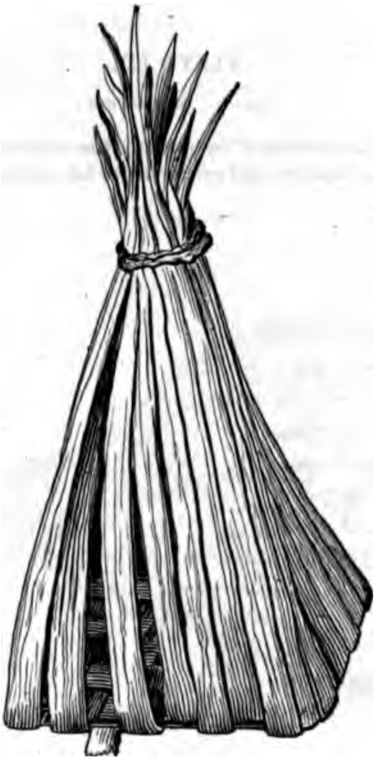


86

FIG. 85. Bottom of plain, woven basket.
FIG. 86. Method of building the sides of a basket.

PLATE LII.

(Mason. Basket-work.)

FIGS. 87, 88. Showing the method of completing the weaving on the sides of an ordinary splint basket, and preparing to lay on the rim.

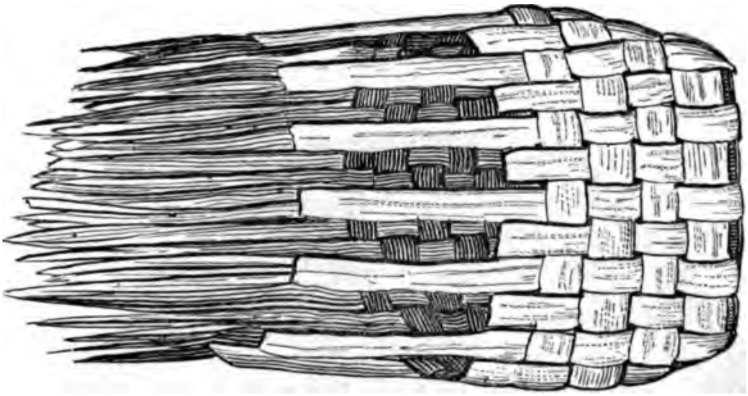


FIG. 88. Basket ready for the rim.

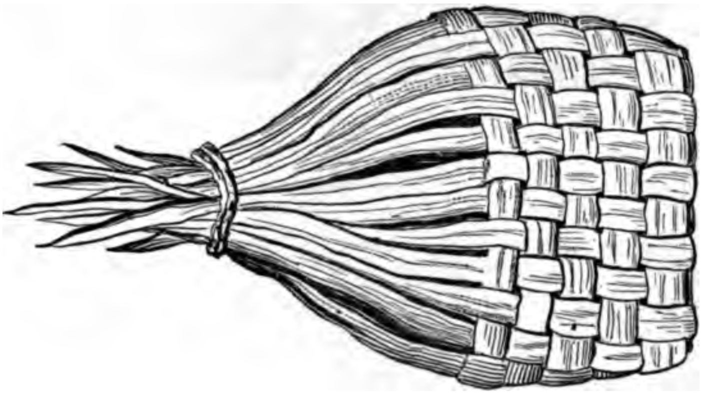


FIG. 87. Side of basket, finished.

PLATE LIII.

(Mason. Basket-work.)

FIG. 89. Twilled woven basket, covered with diaper pattern below, made from cane, by Cherokee Indians. Similar ware is produced by all our southern Indians. The diaper pattern is produced by overlapping two or more warp sticks with each stitch. Collected in North Carolina, by Dr. Edward Palmer, in 1880.

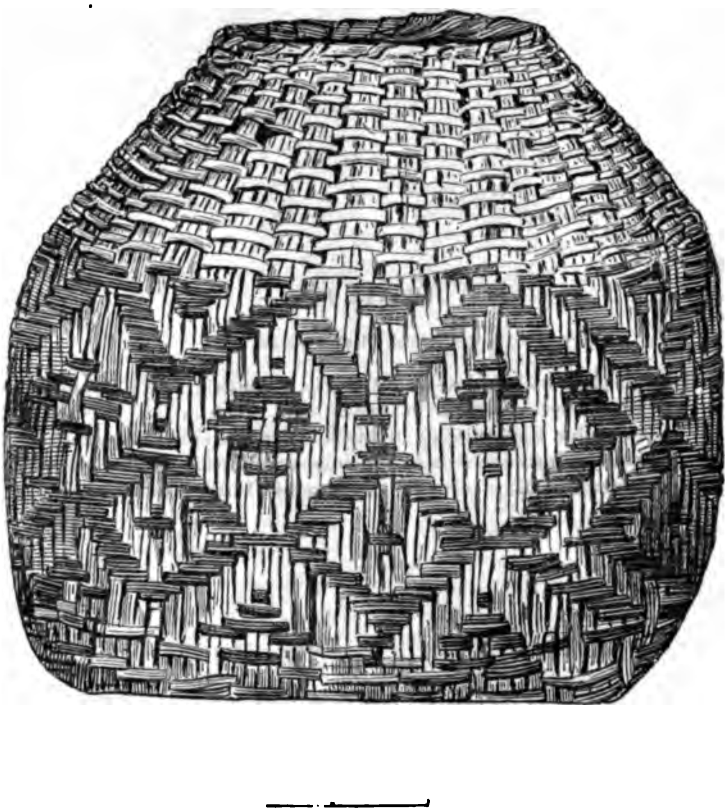


FIG. 89 Cherokee twilled basket of cane.

PLATE LIV.

(Mason. Basket-work.)

FIG. 90. **Twilled palm-leaf basket-wallet of Fiji Islanders, woven double, the inside of plain checker pattern of broad pieces. The exterior covered with every conceivable manipulation of black and white strips of palm-leaf, varying in width. Introduced here for comparison with twilled weaving on our continent. Collected in Fiji, by Captain Wilkes, in 1840.**

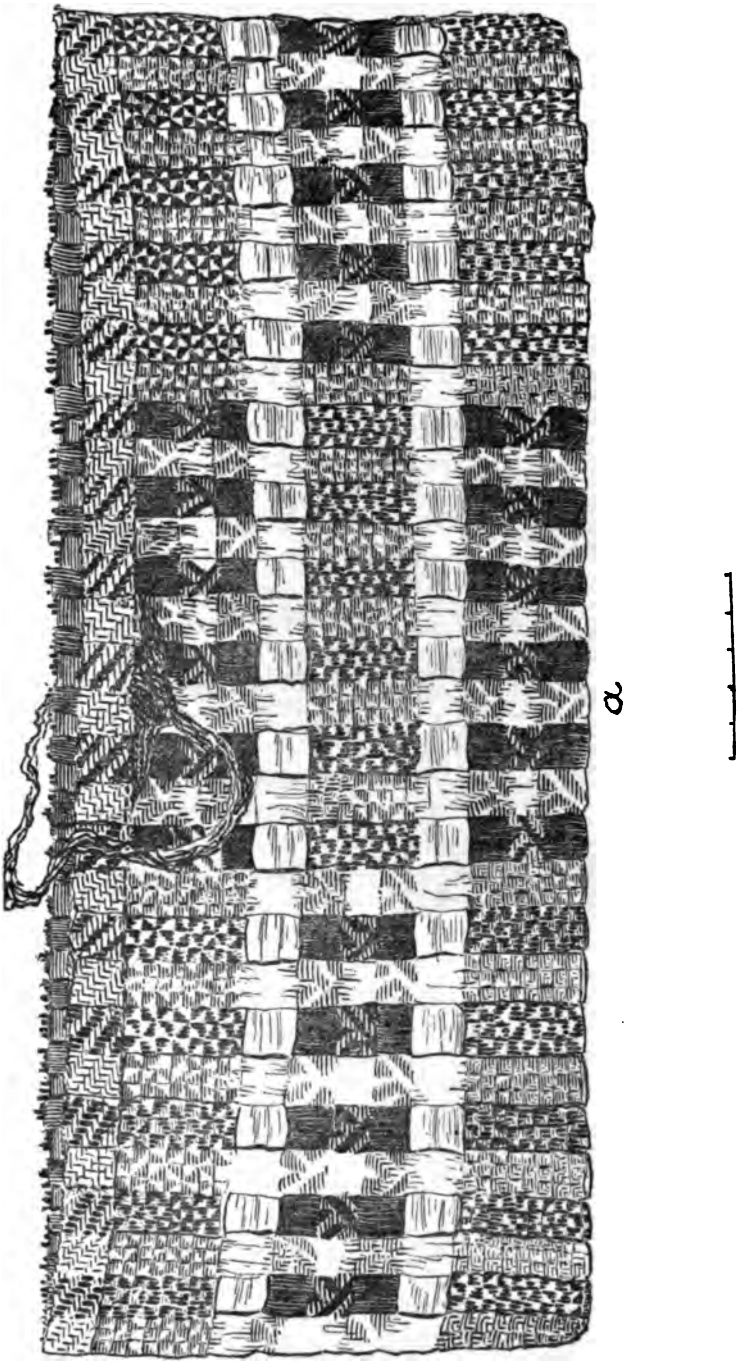
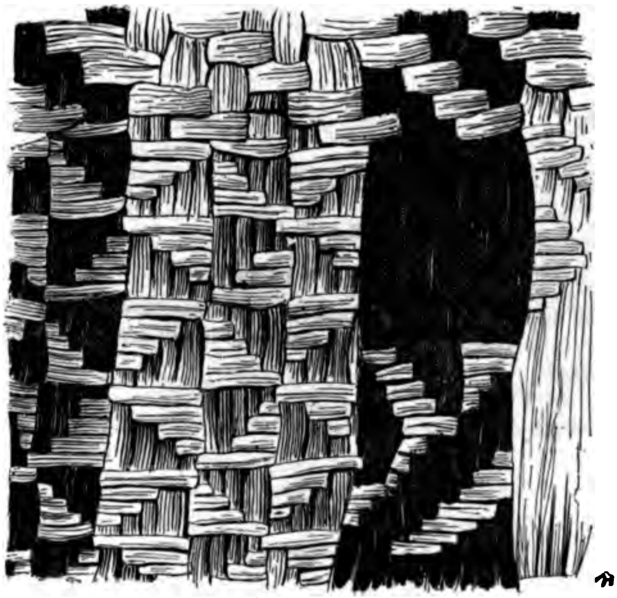


FIG. 90. Fijian twilled basket of palm leaf.

PLATE LV.

(Mason. Basket-work.)

FIG. 91. One square inch of 90 enlarged to show the method of cross-stitching in Fiji basketry, combined with varying width of strips.



b

FIG. 91. One square inch of Fig. 90.

PLATE LVI.

(Mason. Basket-work.)

FIG. 92. Woven fish-basket of Fiji Islanders. This specimen is also woven double, the inside being very coarse. Collected in Fiji Islands, in 1840, by Captain Wilkes.

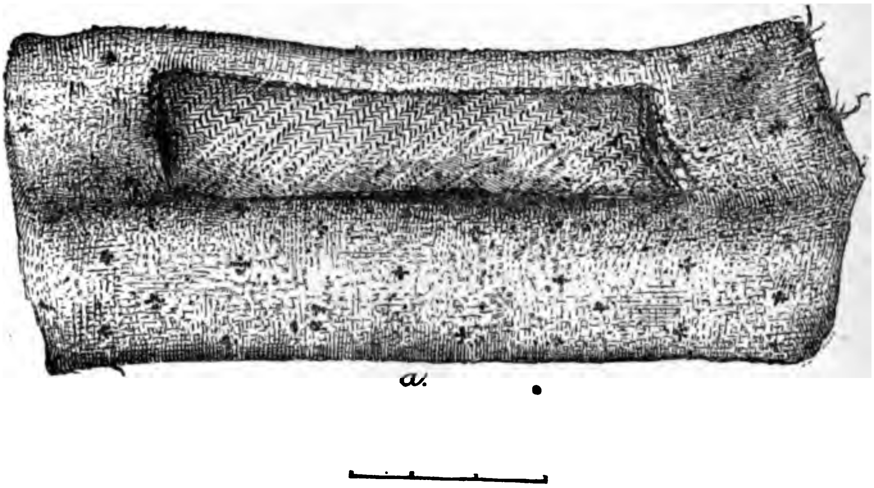
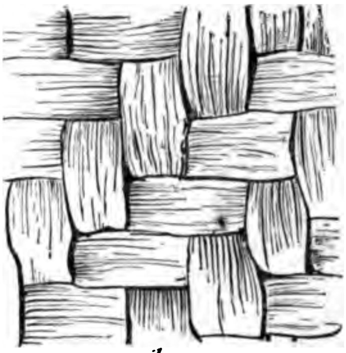


FIG. 92. Fijian fish-basket of palm leaf.

PLATE LVII.

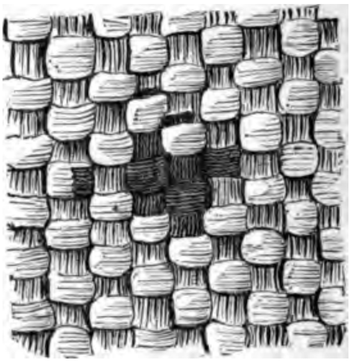
(Mason. Basket-work.)

FIG. 93. One inch of the bottom of 92 enlarged to show the simple twilled weaving.
FIG. 94. Plain weaving on the sides of Fig. 92.
FIG. 95. Coarse weaving of the inside of Fiji basketry.



b

93



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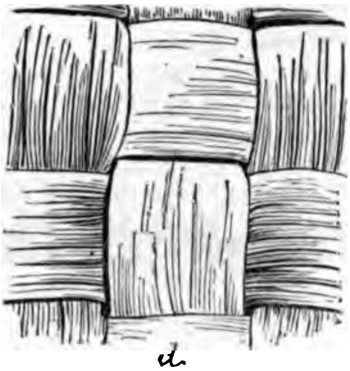


d

95

FIG. 93. One square inch of bottom, Fig. 92.
FIG. 94. One square inch of outside, Fig. 92.
FIG. 95. One square inch of inside, Fig. 92,

PLATE LVIII.

(Mason. Basket-work.)

FIG. 96. Woven basket of Micmac Indians made of white birch. Thousands of these pretty baskets wrought into hundreds of shapes are sold in the towns and villages of the Northern States by the Indian basket-maker. A curious modification of this method of weaving comes from Tripoli, in which the horizontal part is rigid and the weft straws run up and down. It is as if we revolved the Micmac pattern 90 degrees. Collected by Mr. G. Brown Goode, in Nova Scotia.

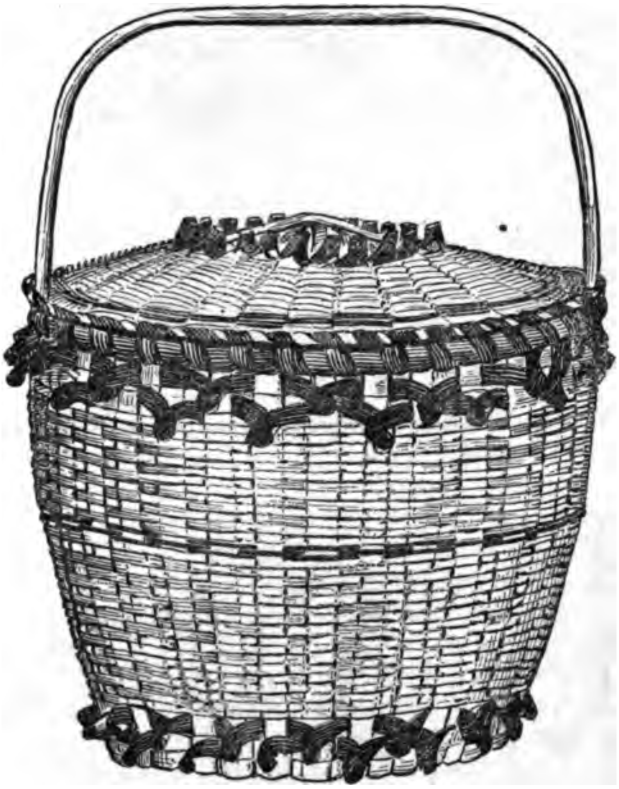
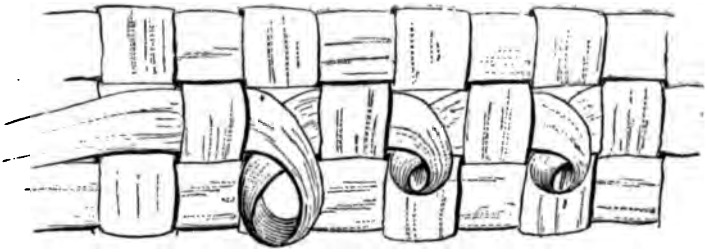


Fig. 96. Micmac woven birch basket.

PLATE LIX.

(Mason. Basket-work.)

FIGS. 97, 98. Showing the method of introducing the curled ornament in Algonquin and Iroquois basketry.



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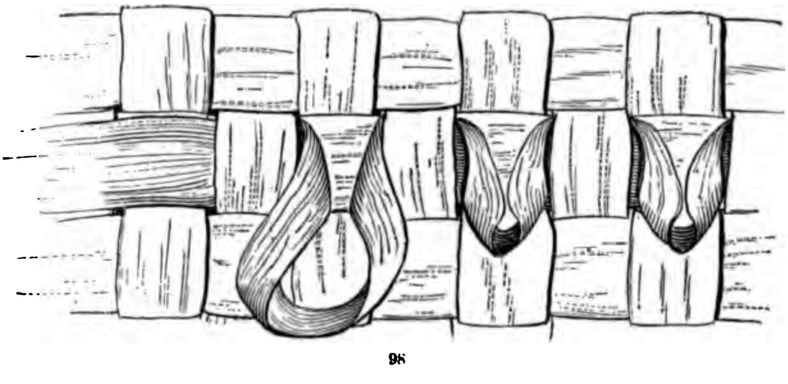


98

FIGS. 97, 98. Method of ornamenting birch baskets.

PLATE LX.

(Mason. Basket-work.)

FIG. 99. Ordinary form of pricker used by Eskimo. Collected at Point Clarence

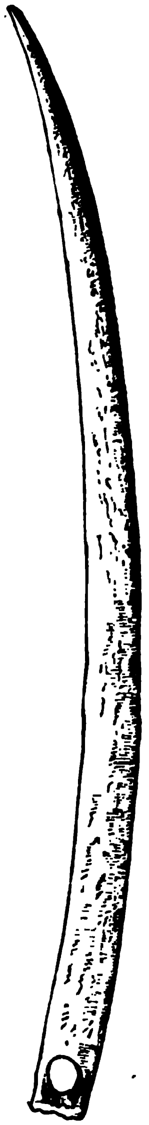
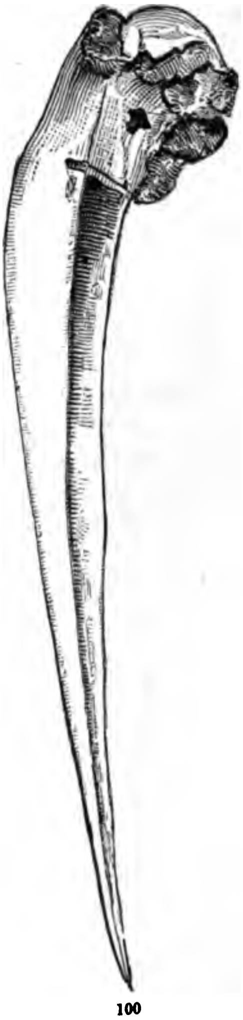


FIG. 99. Eskimo ivory pricker from Point Clarence.

PLATE LXI.

(Mason. Basket-work.)

FIGS. 100–102. Bone, ivory, and metal-pointed prickers from Lower Yukon district.



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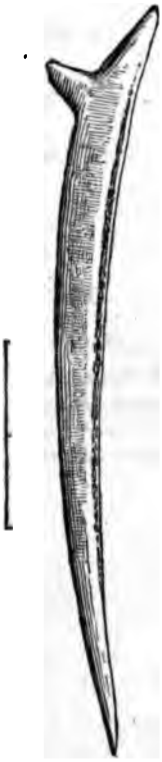

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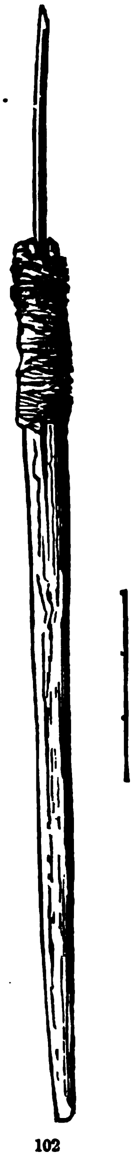


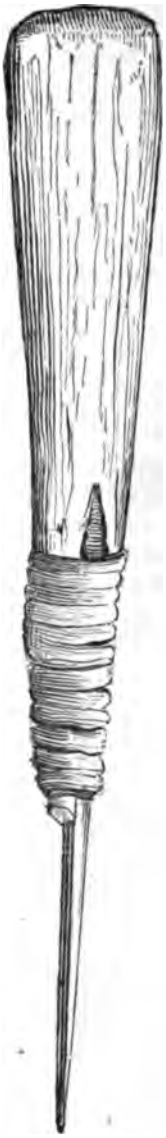
102

FIG. 100. Eskimo pricker of bone.
FIG. 101. Eskimo pricker of antler.
FIG. 102. Eskimo pricker with metal point.

PLATE LXII.

(Mason. Basket-work.)

FIG. 103. Eskimo pricker with wooden handle and iron point lashed with rawhide.
FIG. 104. Eskimo awl, with metal point in ivory handle.
FIG. 105. Eskimo drill-shaft of wood with metal point and band of rawhide. Drills of this class also have beautiful jade points.



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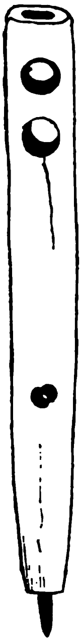

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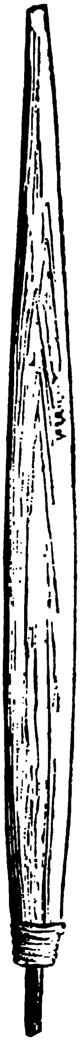


105

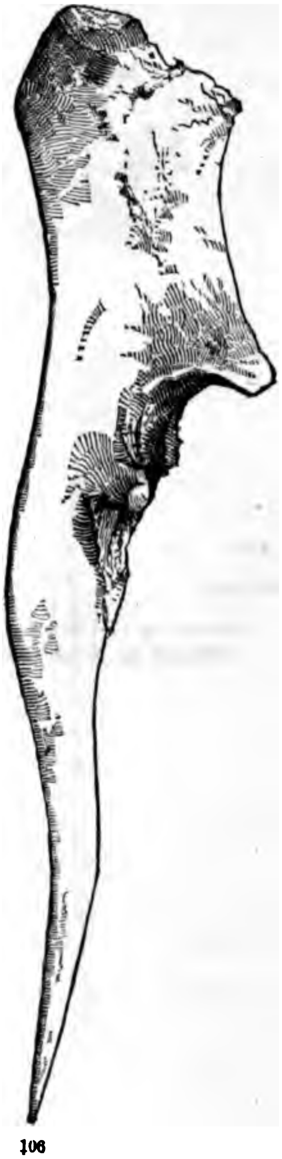
FIG. 103. Eskimo iron-pointed pricker.
FIG. 104. Eskimo iron-pointed awl.

FIG. 105. Eskimo iron-pointed drill.

PLATE LXIII.

(Mason. Basket-work.)

FIGS. 106, 107. Bone prickers used by Moquis. Collected in Arizona, by J. W. Powell.



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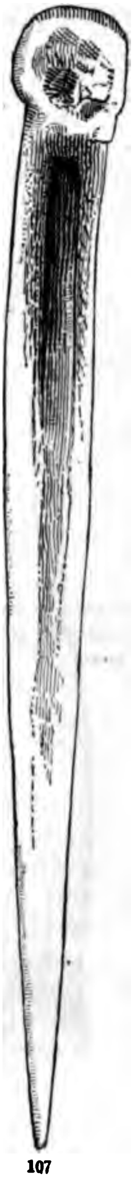


107

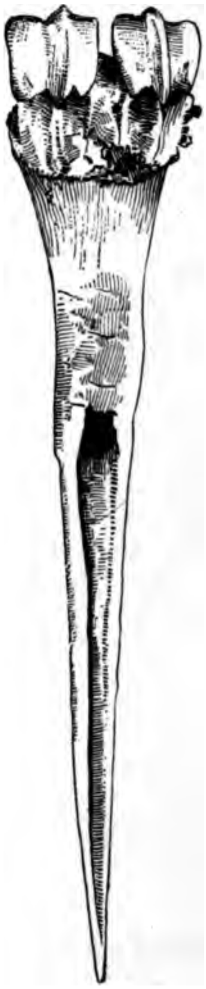
FIGS. 106, 107. Moqui bone prickers.

PLATE LXIV.

(Mason. Basket-work.)

FIG. 108. Bone pricker from Coahuila, Mex. Collected by E. Palmer.

FIG. 109. Iron-pointed pricker of Cherokees. Collected in North Carolina, by E. Palmer.



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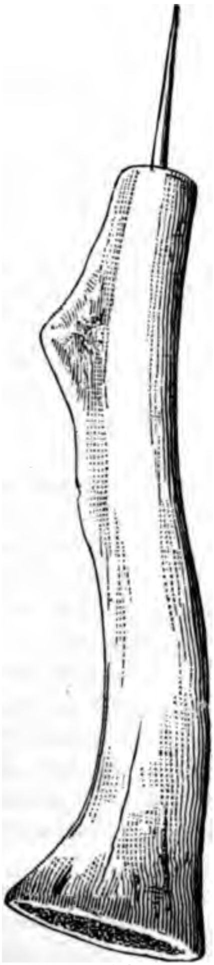

109

FIG. 108. Coahuita bone pricker. FIG. 109. Cherokee pricker in antler.

III.—A STUDY OF THE ESKIMO BOWS IN THE U. S. NATIONAL MUSEUM.

By JOHN MURDOCH.

While endeavoring to work out the method of construction of the bows collected by our party* among the Eskimos of Point Barrow, Arctic Alaska, I was led to make a comparative study of all the Eskimo bows in the National Museum with the view of determining the types of construction to be found among them, and their geographical distribution.

It is the purpose of this paper to present the general conclusions arrived at from this study, which I propose to treat in detail in a monograph of the ethnological collection of the expedition, which I am engaged in preparing. I am indebted to Professor Otis T. Mason, of the National Museum, for much cordial assistance and co-operation in the prosecution of this study and in the preparation of the illustrations.

I have confined myself to the discussion of the forms of bow in use among the Western Eskimos, namely, those inhabiting the shores of the Arctic Ocean from the Mackenzie River westward to Bering Strait, of Bering Sea and the Gulf of Alaska, with the outlying Asiatic branches on the mainland of Siberia and Saint Lawrence Island. These regions are very fully represented in the Museum by the collections of Ross and MacFarlane from the Mackenzie River region, Dall, Turner, Nelson, and others, from the Alaska coast, Nelson, from Saint Lawrence Island, and the North Pacific Exploring Expedition, from the mainland of Siberia, while the material from the eastern tribes is very scanty and unsatisfactory.

Starting from the island of Kadiak in the south, there is abundant material from the whole coast as far as the northern shore of Norton Sound, from the Diomede Islands, Point Hope, Wainwright's Inlet, Point Barrow, and the Mackenzie region, as well as from Saint Lawrence Island and the Siberian shore. Unfortunately, the region about Kotzebue Sound, including the great peninsula between this and Norton Sound, is not represented in the collection.

The field of investigation is practically untrodden. Although it has long been known that the Eskimos used cords of elastic sinew to counteract the brittleness and lack of elasticity in the spruce and fir—the only wood at their disposal for making bows—authors have confined themselves to a general statement of the fact, without going into the details of construction.*

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* U. S. International Polar Expedition to Point Barrow, 1881-'83.

I have found that the bows of the Western Eskimos are constructed upon three well-defined types, each quite distinctly limited in its geographical distribution. No one of these types can be considered as derived from either of the others, but all are plainly developed from a single original type still to be found only slightly modified in the region around Cumberland Gulf, where the mechanical arts seem to have remained in many respects more primitive than either in Greenland or Alaska. (Fig. 1, back and side view of a bow of reindeer antler from Cumberland Gulf, No. 34053, collected by L. Kumlien.)†

The main part of the reinforcement or backing always consists of a continuous piece of stout twine made of sinew, generally a three-strand braid, but sometimes a twisted cord, and often very long (sometimes forty or fifty yards in length). One end of this is spliced or knotted into an eye, which is slipped round one "nock" of the bow, usually the upper one. The strands then pass up and down the back and round the nocks. A comparatively short bow, having along its back some dozen or twenty such plain strands, and finished off by knotting the end about the "handle," appears to have been the original pattern. The bow from Cumberland Gulf (Fig. 1) is such a one, in which the strands have been given two or three turns of twist from the middle. They are kept from untwisting by a "stop" round the handle, which passes between and around the strands.

The three Western Eskimo types may be described as follows:

I. THE SOUTHERN TYPE.

Of this there are two slightly different patterns, found often side by side.

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* For example: "They ingeniously remedy the defect [*i. e.*, the want of elasticity in the material] by securing to the back of the bow and to the knobs at each end a quantity of small lines, each composed of a plat or 'sinnet' of three sinews. The number of lines thus reaching from end to end is generally about thirty; but besides these several others are fastened with hitches round the bow, in pairs, commencing eight inches from one end and again united at the same distance from the other, making the whole number of strings in the middle of the bow sometimes amount to sixty. These being put on when the bow is somewhat bent in the contrary way, produce a spring so strong as to require considerable force as well as knack in stringing it and giving the requisite velocity to the arrow." (Parry's Second Voyage, p. 511.)

"These bows [in the Yukon delta] are made of spruce, which has little elasticity when dry and is very liable to break. To remedy this defect the bow is bound with cords twisted from deer sinew [as shown in a figure, which gives the general appearance very well]. This gives it great strength and overcomes the brittleness of the wood." (Dall's Alaska and its Resources, p. 228.)

"Only some old bows had a finer form. They were larger and made with care; for instance, they were covered with birch bark and strengthed by an artistic plaiting of sinew on the outer side." (Nordenskiöld's Voyage of the Vega, ii, p. 108.)

† *When a scale accompanies a figure each division represents one inch. Figures without a scale are natural size*, unless otherwise specified.

1. A broad and flat bow tapering to the nocks, which are formed by simple rounded knobs, and narrowed and thickened at the handle so as to be half as wide and twice as thick as the broadest part of the bow. The back is flat and the belly often keeled from end to end, and this keel is sometimes deeply furrowed for its whole length; the edges are generally square and sometimes grooved longitudinally. (Figs. 2, 3, and 4 show the general pattern of this type.) The bow when unstrung is either straight, slightly sprung toward the back, or, rarely, arched, and is sometimes stiffened along the back with an extra rib of wood or ivory. The backing is occasionally tightened with wedges Its length is from 50 inches to 5 feet, averaging about 55 inches, with its greatest breath about 2 inches (rarely 2¼ to 2½ inches).

2. A bow of essentially the same size and outline as the first form, but with about one foot of each end bent up toward the back so as to lie parallel to the string when the bow is strung, as in the Tatar bow, with the backing generally stretched over bridges at the bends. (Fig. 5, No. 36028, from the mouth of the Kuskoquim River, collected by E. W. Nelson.)

The backing starts in the ordinary way and consists wholly of straight parallel strands passing round the nocks, or secured by pairs of half-hitches at various points on the bow. The last strand is wrapped spirally round the others to keep them from spreading apart, though occasionally one end of the cable is wrapped with a separate piece, and very rarely the whole wrapping is separate from the rest. A separate piece of twine, thong, or withe serves to stop the backing down to the handle, and there are sometimes other separate stops on the broad part of the bow (as in Fig. 2). The whole of the broad part of the bow is occasionally seized down with spaced spiral turns of twine (Fig. 4, No. 7972, from Bristol Bay, collected by Dr. Minor), which, in one case at least, are made by the end of the last strand. The strands of the backing vary in number from 11 to 37 (usually about 25). They are sometimes all of the same length, in which case the outer strands are hitched round the bow a short distance from the nocks instead of passing round the latter (Fig. 2, back and side view, and Fig. 2 *a*, one end of No. 36032, from near Cape Romanzoff, collected by E. W. Nelson). More commonly 4–22, usually 6 or 7 strands are shorter than the rest and only extend from the broadest part of one end to the corresponding point at the other (Fig. 3, No. 72408, from Bristol Bay, collected by the late C. L. McKay. Fig. 3 *a*, the broadest part of the same bow, to show the attachment of the short strands), thus giving special strength and elasticity to the middle of the bow.

These shorter strands are sometimes the outer ones of the backing, but more commonly about the middle of it. Rarely, as in the case of one bow from the island of Nunivak (Fig. 6, No. 15651, collected by W. H. Dall. This is an unusually large and stout bow, with 37 strands in the cable), and one from near Cape Romanzoff (Fig. 7, No. 36034, collected by E. W. Nelson), the strands are twisted from the middle (the two ends of the bow in opposite directions) by introducing a toggle between the strands, and the twist is secured by passing the "stop" through the cable.

This type extends from the island of Kadiak to Norton Sound. The second form of the type appears to be less common than the first, though occurring alongside of the latter. It appears not to be used on the island of Nunivak or south of the Kuskoquim River.

II. THE ARCTIC TYPE.

This is a much shorter bow than the above (from 43 to 52 inches long), narrow in proportion, and of a much more graceful shape (Fig. 8, No. 1972, from the Mackenzie region, collected by Ross). In section it is nearly elliptical, flatter on the back than on the belly, with the handle slightly narrowed and thickened. The greatest breadth is usually about 1¼ inches, and the thickness at the handle about ¾ inch. The ends are often bent up as in the second form of the southern type, and when this is done the back is usually reinforced with a short rounded strap of wood or antler in the bend. One bow (Fig. 9, No. 89245, from Point Barrow, collected by our expedition) has these ends made of separate pieces mortised on. Only one bow of this type in the collection has an extra rib, which is of antler and very small and short, but the back is frequently covered with strips of sealskin, put on lengthwise.

The backing is always of braided sinew, and of a very complicated and perfect pattern, usually very thoroughly incorporated with the bow by means of hitches and a very complete seizing of many turns running nearly the whole length of the bow and serving to equalize the distribution of the strain and thus prevent cracking.

The backing is one continuous piece of cord, except in one case, where the seizing is separate, and begins, as usual, with an eye, which is slipped round the upper nock. The strands vary in number from 30 to 45 on a man's bow (22–28 on a boy's) of which 10–26 extend only from bend to bend on a bow of the Tatar shape, or between the corresponding points on a straight bow, and are then made fast by two or three half-hitches each, or, as at Point Barrow, Wainwright's Inlet, and Point Hope, by complicated lashings made up of series of half-hitches, often alternately in opposite directions, the last hitch or two held down by extra round turns, and sometimes as many as a dozen hitches in a series. Fig. 10 is this section of the same large bow, No. 89245, from Point Barrow, figured above, and Fig. 11, the same part of No. 72771, from Wainwright's Inlet, also collected by our expedition.

A detailed description of the lashings of these bows, two of the most *complicated in the collection*, will make these figures plain. The first long strand on reaching the bend is hitched round the bow seven times at intervals of about ¾ to 1 inch. These "under-hitches," as they may be called, occur always on bows of this type, sometimes made by the first and sometimes by the last long strand, and serve to mark off the position of the hitches of the short strands and give them a *point d'appui*. The first two of these are "two half-hitches," or, "clove-hitches," as they are called at sea, the other five peculiar hitches (Fig. 12) not used by sailors. The hitch is well known and much used in the artillery and ordnance service, and is there called a "clove-hitch." As using this name would not distinguish the hitch from the common "clove-hitch" of seamen, I venture to suggest for it the name of "soldier's hitch." It is made by taking two round turns round the object to be fastened to and bringing the end over the standing part and under the two turns. If the turns are taken to the left, it makes Fig. 12; if to the right, Fig. 13.

These hitches, especially the left-handed one, are much used by the Eskimos not only on bows, but in putting on seizings upon spears, &c., where a white seaman would use a "marling-hitch." The advantage of this form of hitch seems to be that the second round turn keeps it from slipping if the end gets loose.

To return to No. 89245: After making "under-hitches" at both bends, long strands are laid on till there are ten in all. The eleventh, on reaching the bend, makes two "soldier's hitches" at 1, and going to the other nock is similarly hitched at the other bend, and then passes backwards and forwards between the bends, hitched each time nearer the middle of the bow. The hitch at 2 is made thus: Two round turns to the left, the end passed under both turns, and then two more round turns, with the end passed over the second turn, under the first and third, over the standing-part and third turn, making a double "soldier's hitch." At 3 are two simple half-hitches, and one made with two round turns, followed by two round turns with the end passed under both. At 4 is a similar lashing with eight simple hitches; at 5, nine; at 6, four; and at 7, two.

In No. 72771 there are five "under hitches," all "soldier's hitches," made by the first long strand. The lashing at 1 is made by hitching alternately to right and left five times. (Such hitching is called "kackling" by seamen.) At 2 it is "kackled" nine times, at 3 nine times, and at 4 nine times again, ending with a half-hitch at 5.

It will easily be seen, as was suggested to me by Professor Mason, that the strain of bending the bow, while tending to stretch and tighten each longitudinal strand, at the same time tightens each individual turn of these lashings, so that the greater the strain on the bow the tighter do they grip the fibers of the wood and hold them together.

These hitches usually occupy 4 to 6 inches of the bow, and as a rule are put on as above, so that the shortest strands come at the top of the backing, though they are reversed on one bow from the Mackenzie region (Fig. 14 is this section of No. 1970, collected by Ross), so that the longer of the strands are stretched across the bends, which adds somewhat to the tension of the bow, but makes a less neat and compact lashing than the common arrangement. This arrangement of the short strands brings the greatest strength across the middle of the bow, where it is most needed.

All the strands between the hitches are divided into two equal parcels and twisted from the middle into two cables, thus greatly increasing the tension to be overcome in drawing the string. These two cables are fastened together by a sort of "figure-of-8" knot, passing through and around them, and are stopped firmly to the handle, after which the whole is securely seized down with the end of the backing. This seizing is less complete in bows from the region of the Mackenzie. In one case, after completing the seizing the end goes on to lay on a few strands more, for a third cable, outside of and between the other two, which is also twisted. (No. 89245, Figs. 9 and 10. End of cable cut off at *a*.)

The ends of the long strands, between the nocks and the hitches of the short strands, are sometimes wound with separate pieces.

Bows of this pattern, differing only in details of the backing, are used at the Mackenzie River, at Point Barrow, Wainwright's Inlet, Point Hope, and the Diomede Islands in Bering Strait, and probably at intermediate points along the shores of the Arctic Ocean.

As was said above, there are no bows in the collection from Kotzebue Sound or the Kaviak Peninsula, but from several points in the region in question, namely, from Kotzebue Sound, Hotham Inlet, Sledge Island, and Cape Nome, have been obtained many of the ingenious little tools for twisting the cables, and always in pairs, indicating that a two-cable bow of the Arctic type is the prevailing if not the only weapon of the kind used in these localities.

The line of demarcation between this type and the preceding is not sharply drawn, although there are no bows of the pattern which is exclusively used as far north as Cape Romanzoff, in the collection from north of Bering Strait.

From the Yukon delta we have one bow (Fig. 15, No. 33867, collected by E. W. Nelson), which in proportional narrowness and thickness approaches the Arctic model, as it does in its complete seizing, though it has a strong extra rib, and the general pattern of the backing is purely southern. From the same region is another (Figs. 16 and 17, No. 8822, collected by W. H. Dall), which in outline and size is essentially of the straight southern type, though slightly narrower than usual, while the backing is put on entirely in the Arctic manner, except that the seizing is less complete. A large bow from Norton Sound is of the same model, but has the Arctic backing complete in all its details, as does also a small boy's bow from the same region. Still another from the same place is almost exactly of the Arctic type, except that it has square instead of rounded edges and the strands are not twisted into cables.

When we consider that the Malemut of Norton Sound act as middlemen between the natives of the Arctic coast and those of the Yukon region, it is natural to expect to find traces of Arctic ideas as far south as their intercourse extends, namely, as I am informed, to the mouth of the Yukon. Moreover it would be unlikely that the relatively weak southern backing should be adopted by the northern natives.

III. THE WESTERN TYPE.

This is, in general, broader and flatter than the Arctic model, but less contracted at the handle than the southern, and not so much tapered at the ends, which are usually thick. It is rather a larger bow than the Arctic, but not so large as the southern, being from 43 to 58 inches in length and 1.5 to 1.7 inches broad, and like the others is either straight or of the Tatar shape. Bows of purely western type are apparently always of the latter shape.

The peculiarity of the type is in the backing, as is well shown in the bow figured (Figs. 18 and 19, No. 2505, probably from the mainland of Siberia. It was collected by the North Pacific Exploring Expedition, and is labeled simply "*Tschuktschis Indians*"!). The backing, instead of being continuous, is in three parts, namely, two short cables stretched across the bends, where they do not go round the nocks, but are secured by half-hitches close to them as well as inside the bends. The main backing consists of 21 strands laid on between the bends with half-hitches, and stopped down to the bow with a spiral seizing without being twisted or gathered into a wrapped cable.*

Three large and powerful bows from Saint Lawrence Island are of the same peculiar type. It is, however, worthy of note that a single "twister" of the same pattern as those used at Point Barrow was obtained at Saint Lawrence Island by Mr. Nelson.

The bows used by the Eskimos of Eastern Siberia ("Tuski," "Sedentary Chukches" of authors, Chuklukmut of Dall) present a mixture of types. The bow figured above is purely western in type. Another (Figs. 21 and 22, No. 2508, collected by the North Pacific Exploring Expedition) is straight, but still has separate cables at the ends, passing, however, round the nocks. The main backing has upwards of seventy strands and is twisted into three cables of the Arctic type.

A third (Figs. 23 and 24, No. 2506, collected by the North Pacific Exploring Expedition) approaches very close to the arctic type, but shows traces of the western model in having the ends of the long strands stretched across the bends and one single short strand returning to the tip from beyond the bend,* while a fourth is precisely of the arctic type with a very large number of strands.†

---

* There is a modification of the "soldier's hitch" in the seizing of this bow (Fig. 20), made by taking two round turns to the right, and passing the end *under* the standing part and *between* the two turns.

Several of these bows are made of oak, evidently barrel-staves obtained from white men, but are, notwithstanding, provided with a powerful backing, which shows how inseparably this invention, in its origin applicable only to inelastic wood, has become connected with the idea of a bow in the mind of the maker.

Comparing what I have said of the geographical distribution of these types of bow with the divisions of the Eskimos of the Northwest adopted by Mr. Dall,‡ it will be seen that of the Western Mackenzie Innuit (his first great division) the Kopagmut (*Kupû'ñmeun* of the Point Barrow natives) and probably the Kangmaligmut (*Kûñmû'd'lĭñ* of the same people, an almost unknown tribe, concerning whom there appears to be no reliable information), with probably all the Western Innuit except the Chuklukmut, Kikhtŏ'gamut, and Mahlemut, use the pure arctic type. The Chuklukmut and Kikhtŏ'gamut use the western type, with some admixture of the arctic. The Mahlemut and Unaligmut (the northernmost tribe of Fishing Innuit) use the arctic and the southern type and intermediate forms, while the remainder of the Fishing Innuit use the pure southern type.

Assuming, as is highly probable, that all the branches of the Eskimo race started with the primitive form of bow above described, the inhabitants of the well-wooded shores of Bering Sea and the Gulf of Alaska, who have a plentiful supply of fresh living spruce, have improved on this type chiefly by lengthening and strengthening the wood of the bow and collecting the loose strands into a compact round cable, which is occasionally made somewhat thicker across the middle than towards the ends.

Those who live on the treeless shores of the Arctic Ocean are forced to depend on comparatively scarce dead and brittle drift-wood, and have been obliged to devote their attention to the improvement of the sinew backing in order to increase the efficiency of the weapon. The consequence has been the development of the exceedingly complicated and perfect form above described. This is probably the ultimate step in the development of the sinew-backed bow. Not only is it difficult to imagine making a more perfect weapon from the materials, but attention will no longer be paid to possible improvements in a weapon which is rapidly passing into disuse and becoming superseded by fire-arms.

The people of Saint Lawrence Island, out of the direct line of communication between the two continents and also dependent on driftwood, have developed the bow in a different way from all the rest.

---

* A peculiar clove-hitch (Fig. 25) occurs at each end of this bow.

† This bow (No. 2507) has a reversed "soldier's hitch" in the seizing (Fig. 26) in which the end passes *under* the standing part and *over* the turns.

‡ Contributions to North American Ethnology, vol. i, p. 23.

They have, as it were, lengthened the ends of the bow beyond the original backing, bent them up, and added extra cables across the bends.

On the mainland of Siberia, where the natives are in direct communication both with Saint Lawrence Island and the arctic shores of the New World, by way of the Diomedes, the bow is of a pattern intermediate between the types of these two regions, partaking more of the characteristics of one or the other, according to the fancy of the maker, perhaps as his dealings have brought him in contact with people of one or the other region.

There is one bow in the Museum, not an Eskimo bow, which is interesting in the present connection. It comes from Sitka, where the Indians use a plain spruce or cedar bow with a round back and flat belly. The bow in question is of the same shape as the other bows from the same locality, but the maker, who has evidently had some acquaintance with the handiwork of the nearest Eskimos, has tried to improve it by putting on a typical "southern" backing of sinew. This, however, is of but little use, as the round back of the bow is not of the proper shape to receive it, and, in spite of the lashing round the handle, it slips off to one side as soon as the bow is bent. I may remark that the bow appears to be new and never to have been used.

NOTE.—It should be borne in mind that what I have said about the geographical distribution of the different forms of bow refers not to the present time, but to the period when this weapon was in general use among the Eskimos of the Northwest. Most of the material in the Museum collection was either collected many years ago or shows signs of having been old and disused when collected.

Fire-arms have so completely superseded the older weapon, especially at the great trading centers like Saint Michael's, that even in distant localities, like Point Barrow, it would be difficult to find half a dozen full-sized bows fit for service. The boys still adhere to the bow for shooting small birds, &c., and for them it is still made as carefully as ever.

NOTE ON THE SINEW-TWISTING TOOLS.—In the above paper, I have had occasion to speak of the toggles or levers used in twisting up the cords of sinew on the back of the bow, making what I have called "cables." These are little flat rods of ivory or hard bone (Fig. 27, No. 89466, front and side view, from Point Barrow, collected by our expedition), about four or five inches long, with the ends slightly bent in opposite directions. These rods serve a double purpose at Point Barrow, for the natives use them for playing a game something of the nature of "pitch-penny." We purchased a number of them under the impression that this was their only use, and it was not until we had been a long time at the station that we were told that two of them made a set and that they were used, somehow, in twisting the sinews on the back of the bow. So few bows are now made that we had no opportunity of seeing them in use.

In looking over the Museum collections on my return, I found large numbers of these tools, all essentially of the same pattern, and generally in pairs, often accompanied by a small ivory marlinespike. They came from many localities along the coast from the Mackenzie region to Norton Sound, and were variously labeled "bow tools," "bow-string twisters," and "arrow polishers" (!) without further explanation, except in the case of one pair collected by Mr. Nelson, which were catalogued as for "tightening the sinew on a bow. Always used in pairs."*

I have been unable to find any published explanation of the method of using these tools. After wasting much time in conjectures, I discovered the *modus operandi* by actual experiment, while making a model of one of the Point Barrow bows. It is very ingenious, and is well shown in the diagram (Figs. 28 and 29, drawn from a working model), The end *a* is thrust between the strands to be twisted, so that the hook catches part of them, and the lever making a half-revolution is brought up against the bow, as in Fig. 28. It can continue the twisting no further in this direction, and if withdrawn for a fresh start the strands would have to be held or fastened in some way, which would make the process a slow one. Accordingly, the rod is thrust through between the strands until the end *b* is where *a* was (Fig. 29), when the hook at *b* catches the strands and the lever is ready for another half-revolution. This is continued, the rod slipping back and forth like the handle of a vise, until the cable is sufficiently twisted.

The reason for using them in pairs was not satisfactorily explained, until Lieut. P. H. Ray, the commanding officer of our expedition, suggested that they could be used simultaneously, one in each cable, so as to secure the same amount of twist in the two. I tested this and found it perfectly easy to work one with each hand.

The accompanying map is a tracing, with some modifications, of part of Mr. Dall's "Alaska and Adjoining Region."

---

* Mr. Nelson has kindly favored me with all the information he was able to obtain about these implements. He never saw them in actual use, but the natives of the region about Norton Sound informed him that they were used for "twisting the sinew strands first and then for tightening the plaited or braided sinew backing to the bows after the latter was in place." He describes their use for twisting sinew to make the "hard-laid sinew cord," as follows: "The ends of the sinew cord are tied to the small center holes in the two ivory pieces, one of the latter at each end of the cord, and then they are twisted in opposite directions." He tells me that they are also used for playing a game as at Point Barrow.

PLATE I.

(Murdoch. Eskimo bows.)

FIG. 1. Bow of reindeer antler, with simple backing of sinew, from Cumberland Gulf, No. 34053. Collected by L. Kumlien. Side and back, reduced.

FIG. 2. Straight bow, with simplest form of "Southern" backing, from near Cape Romanzoff, No. 36032. Collected by E. W. Nelson. Side and back, reduced.

NOTE.—Every reduced figure is accompanied by a scale, on which each division represents one inch.

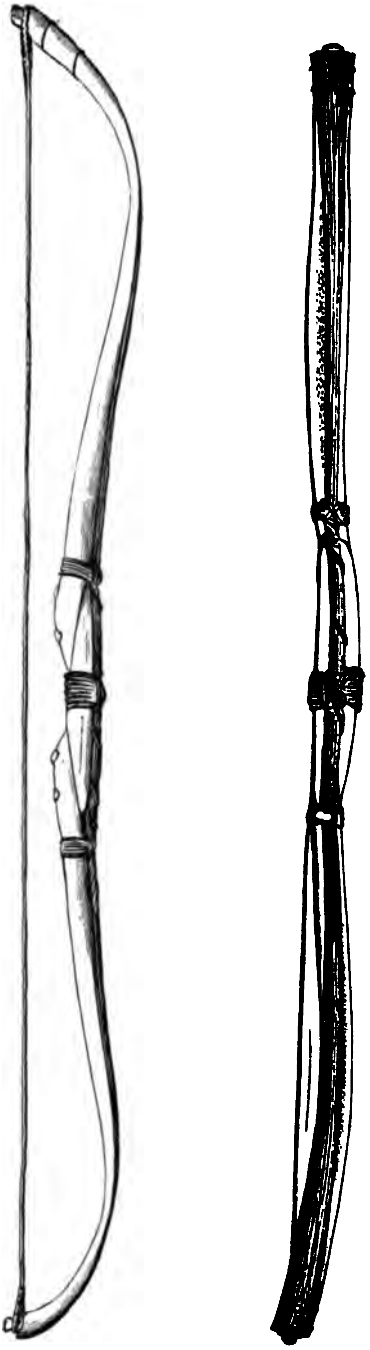


FIG. 1.

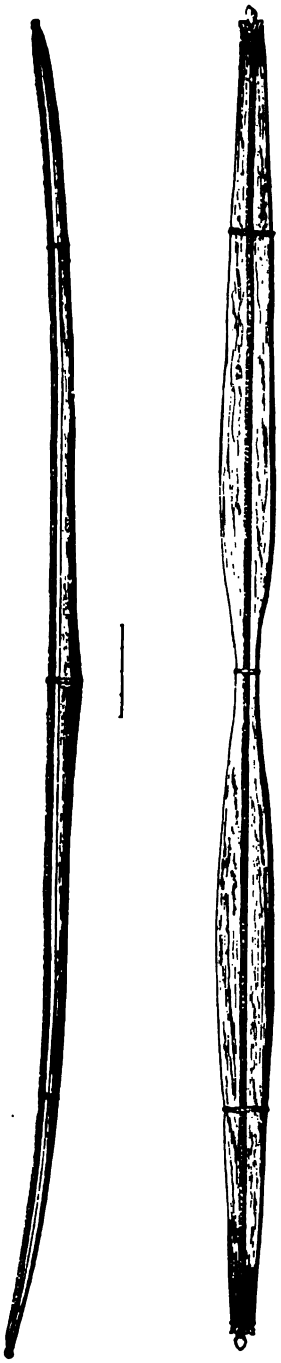


FIG. 2.

PLATE II.

(Murdoch. Eskimo bows.)

Fig. 2*a*. One end of No. 36032 (from near Cape Romanzoff. Collected by E. W. Nelson) to show attachment of the backing to the nock. Natural size.

Fig. 3. Straight bow, with "Southern" backing, in which some strands are short, No. 72408, from Bristol Bay. Collected by the late C. L. McKay. Back, reduced.

Fig. 3*a*. The broadest part of the same bow, to show the attachment of the short strands. Natural size.

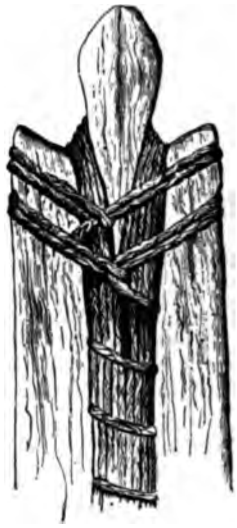


FIG. 2*a*.

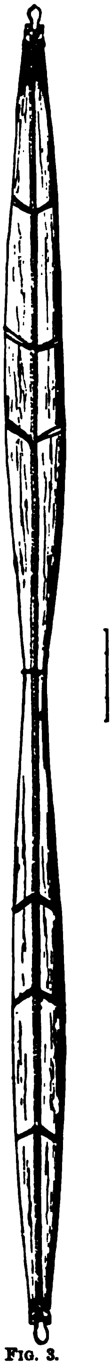


FIG. 3.

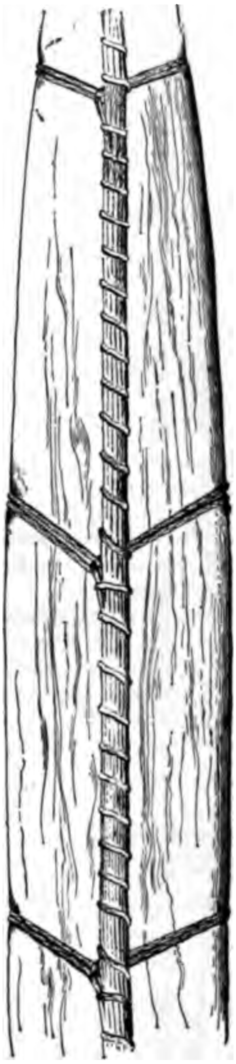


FIG. 3*a*.

PLATE III.

(Murdoch. Eskimo bows.)

Fig. 4. Straight bow, with "Southern" backing, No. 7972, from Bristol Bay. Collected by Dr. Minor. One-half of back, reduced, to show spiral seizing.

Fig. 5. Bow with bent ends, with "Southern" backing, strung, No. 36028, from the mouth of the Kuskoquim river. Collected by E. W. Nelson. Side, reduced.

Fig. 6. Large straight bow, with "Southern" backing, *twisted*, No. 15651, from Nunivak Island. Collected by W. H. Dall. One-half of back, reduced.

Fig. 7. Straight bow, with "Southern" backing, No. 36034. Collected by E. W. Nelson. One-half of back, reduced.

PLATE III.

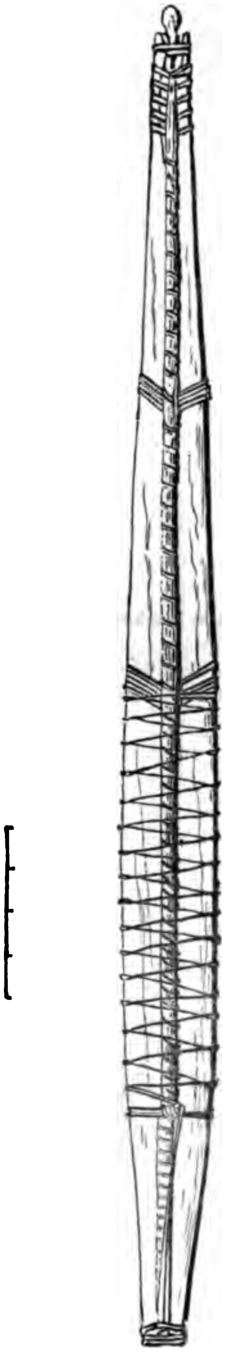


FIG. 4.

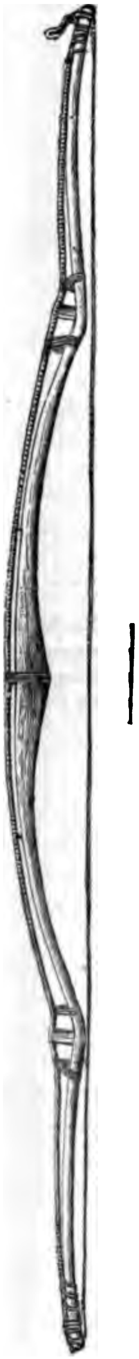


FIG. 5.

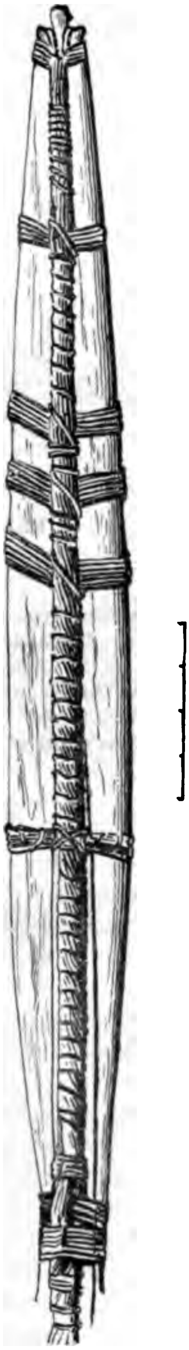


FIG. 6.

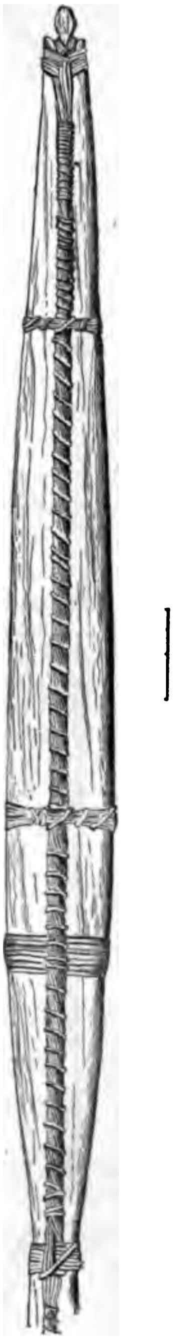


FIG. 7.

PLATE IV.

(Murdoch. Eskimo bows.)

Fig. 8. Straight bow of "Arctic" type, strung, No. 1972, from the Mackenzie region. Collected by Ross. Side and back, reduced.

Fig. 9. Bow of Tatar shape, with "Arctic" backing, No. 89245, from Point Barrow. Collected by United States International Polar Expedition. Side, reduced.

Fig. 12. Left-handed "soldier's hitch."

Fig. 13. Right-handed "soldier's hitch."

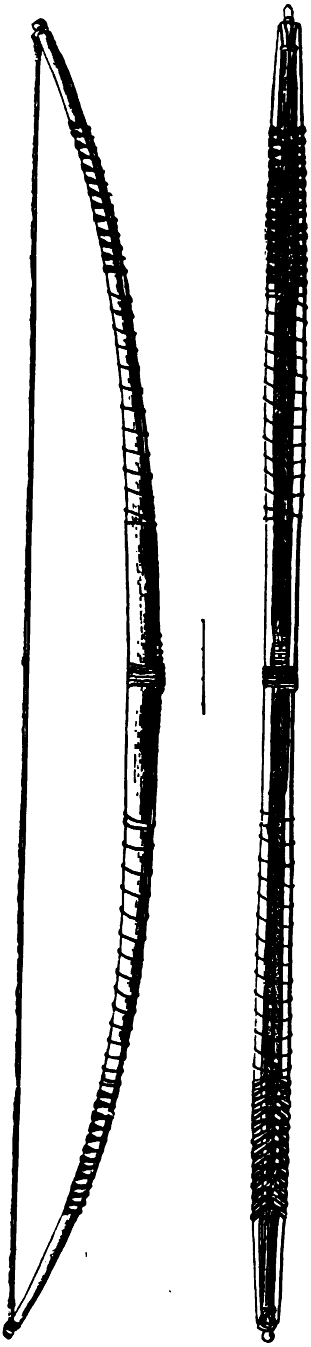


FIG. 8.

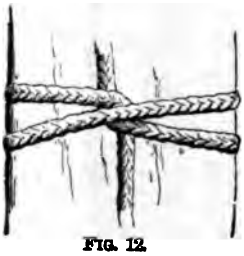


FIG. 12.

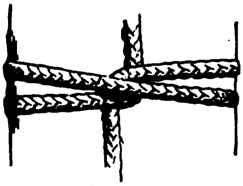


FIG. 13.

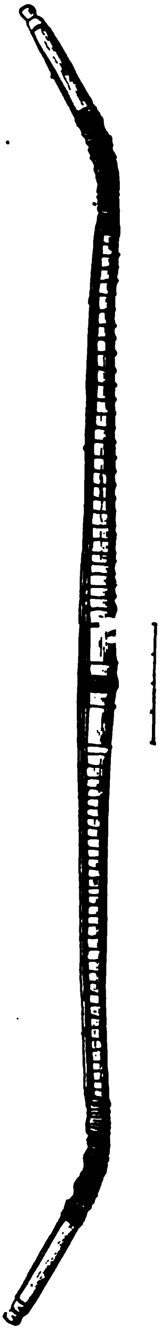


FIG. 9.

PLATE V.

(Murdoch. Eskimo bows.)

FIG. 10. Section of "Arctic" bow, No. 89245, to show method of attaching the short strands. Natural size.

FIG. 11. Same section of No. 72771, from Wainwright's Inlet. Collected by United States International Polar Expedition. Natural size.

PLATE V.

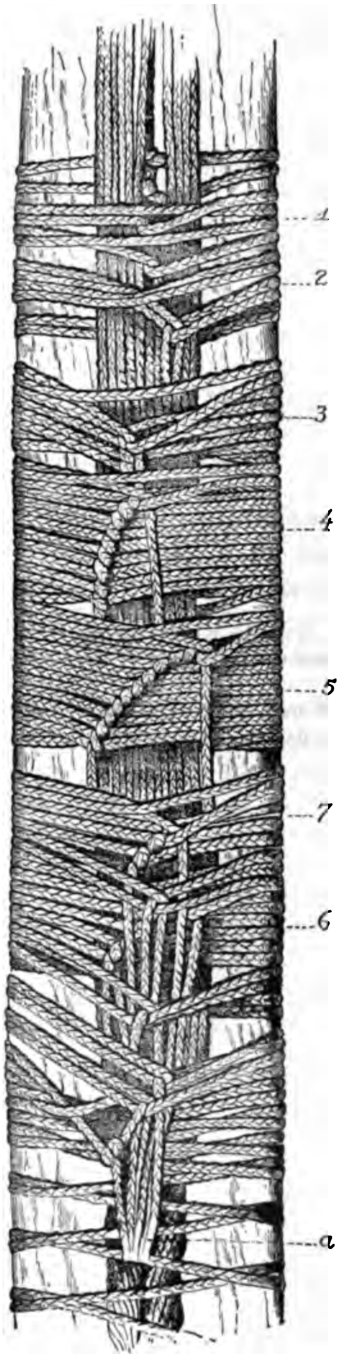


FIG. 10.

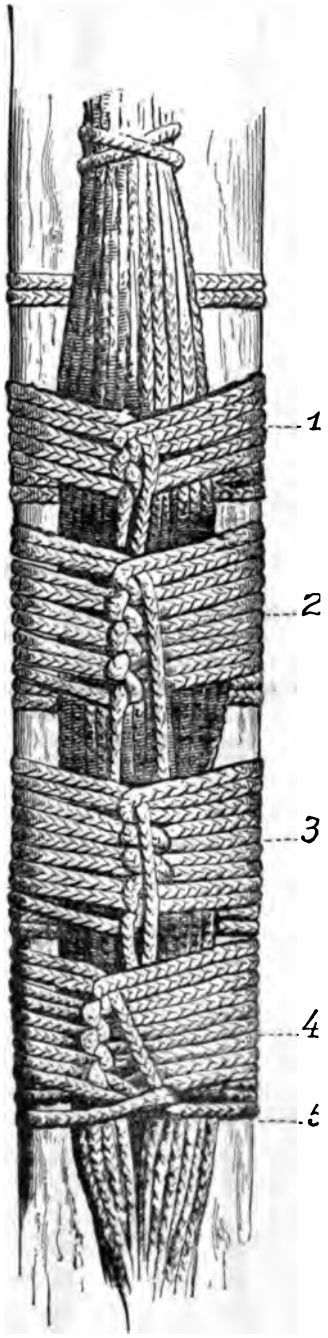


FIG. 11.

PLATE VI.

(Murdoch. Eskimo bows.)

FIG. 14. Section of an "Arctic" bow (No. 1970, from the Mackenzie region. Collected by Ross) to show the peculiar (reversed) attachment of the short strands. Natural size.

FIG. 15. Straight "Southern" bow, No. 33867, from the Yukon delta. Collected by E. W. Nelson, unusually thick and narrow, with complete spiral seizing. Back and side, reduced.

PLATE VI.

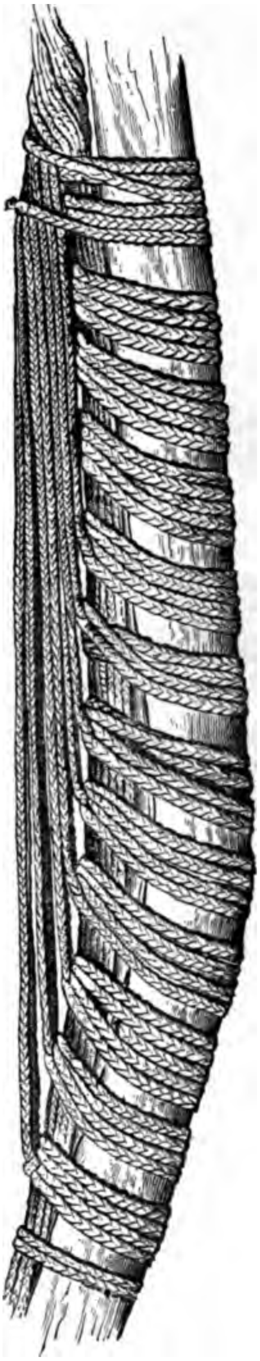


FIG. 14.

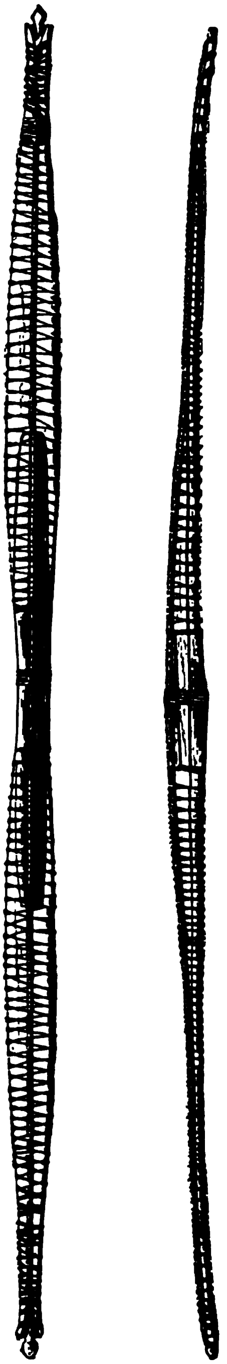


FIG. 15.

PLATE VII.

(Murdoch. Eskimo bows.)

FIG. 16. Straight bow of "Southern" model, with "Arctic" backing, No. 8822, from the Yukon delta. Collected by W. H. Dall. Back, reduced.

FIG. 17. Section of the same bow, natural size, to show the attachment of the short strands.

FIG. 18. Bow of "Western" type, No. 2505, from the mainland of Siberia. Collected by the North Pacific Exploring Expedition. Back and side, reduced.

PLATE VII.

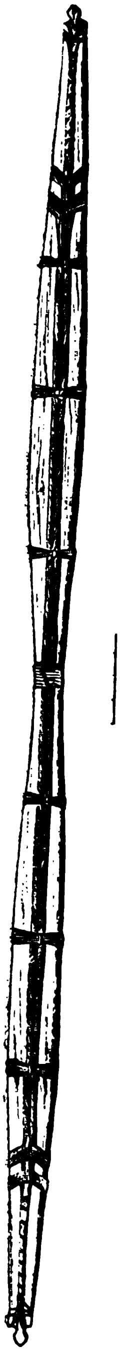


FIG. 16.

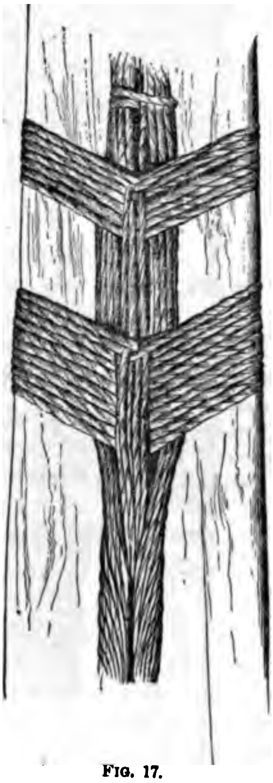


FIG. 17.

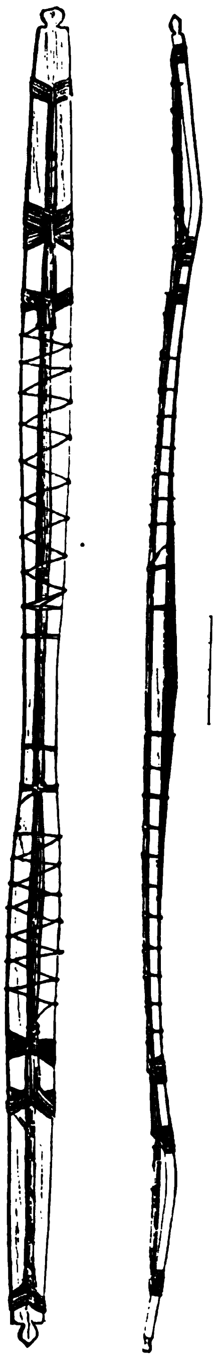


FIG. 18.

PLATE VIII.

(Murdoch. Eskimo bows.)

FIG. 19. Section of No. 2505, to show the attachment of the end cable, underneath the backing. Natural size.

FIG. 20. Modified "soldier's hitch," used on seizing of No. 2505.

FIG. 21. Straight bow, with "Western" backing, No. 2508, from Eastern Siberia. Collected by the North Pacific Exploring Expedition. Back, reduced.

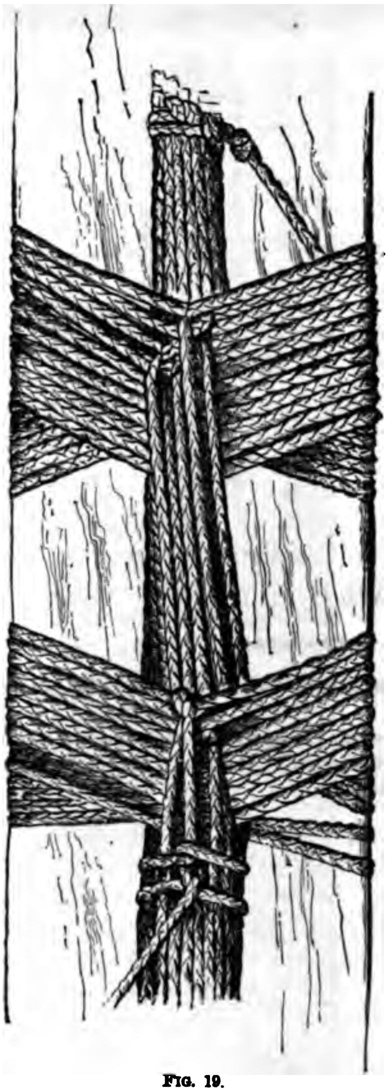


FIG. 19.

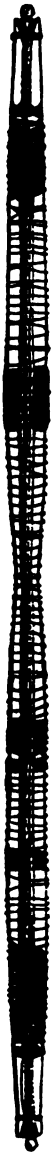


FIG. 21.

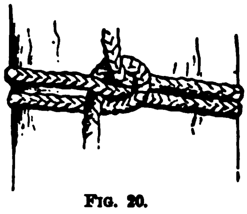


FIG. 20.

PLATE IX.

(Murdoch. Eskimo bows.)

FIG. 22. Section of No. 2505, to show the attachment of the end cable, underneath the backing. Natural size.

FIG. 23. Bow with "Arctic" backing, modified so as to approach the "Western," No. 2596, from Eastern Siberia. Collected by the North Pacific Exploring Expedition. Back and side, reduced.

PLATE IX.

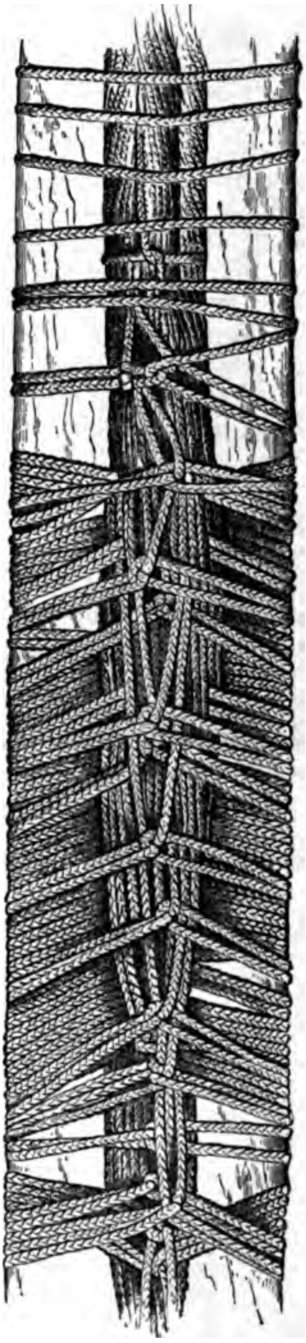


FIG. 22.

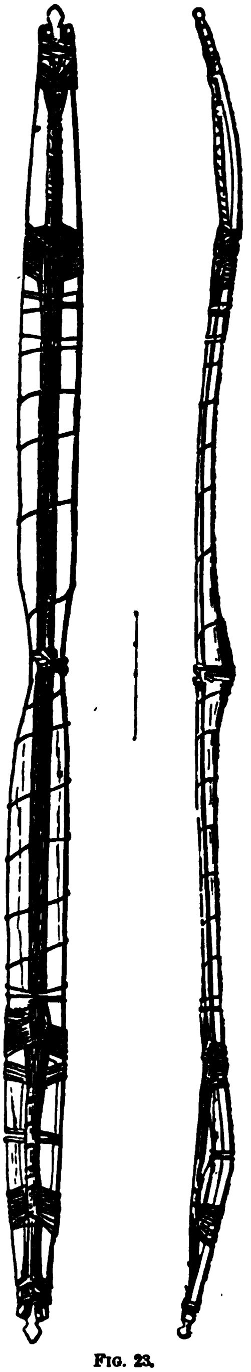


FIG. 23.

PLATE X.

(Murdoch. Eskimo bows.)

FIG. 24. Section of No. 2506, to show the attachment of the single short strand, returning from bend to nock. Natural size.

FIG. 25. Peculiar clove-hitch used on the same bow.

FIG. 26. Reversed "soldier's hitch" in the seizing of No. 2507, from Eastern Siberia. Collected by the North Pacific Exploring Expedition.

FIG. 27. Sinew-twisting tool of ivory, No. 89466, from Point Barrow. Collected by United States International Polar Expedition. Front and side, natural size.

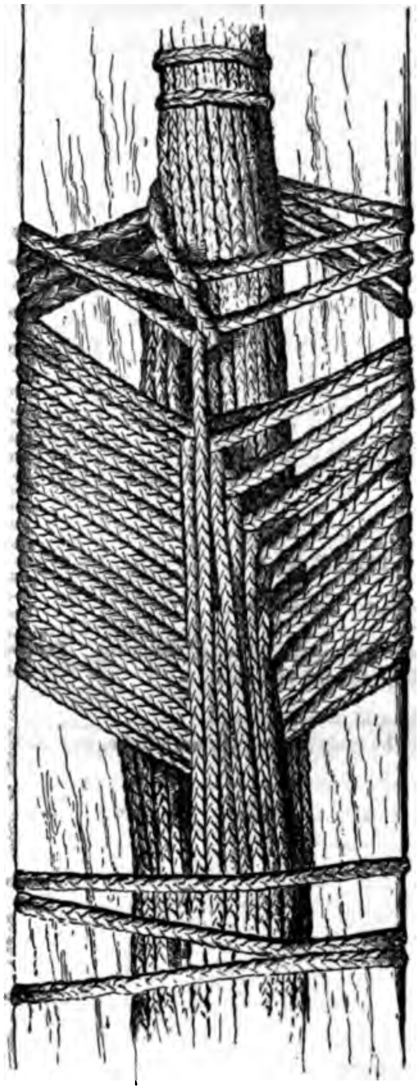
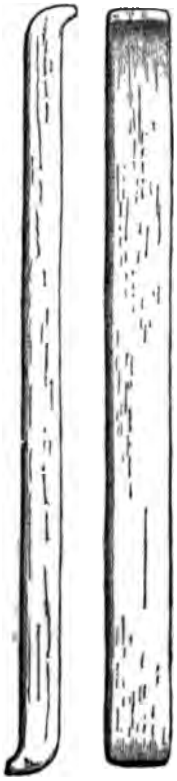


FIG. 24.



IG. 27.

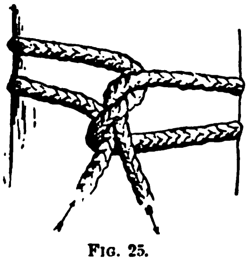


FIG. 25.

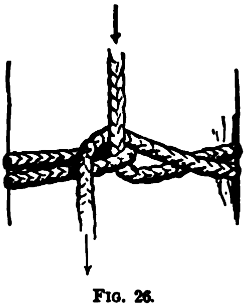


FIG. 26.

PLATE XI.

(Murdoch. Eskimo bows.)

The process of twisting the two "cables" of the "Arctic" backing. From a working model, reduced one-half.

FIG. 28. Position of the tools at the end of a half-turn.
FIG. 29. Position of the same, with the tools slipped through to begin a new half-turn.

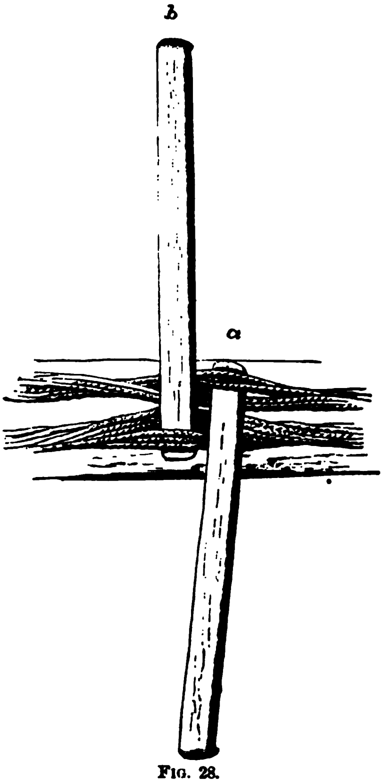


FIG. 28.

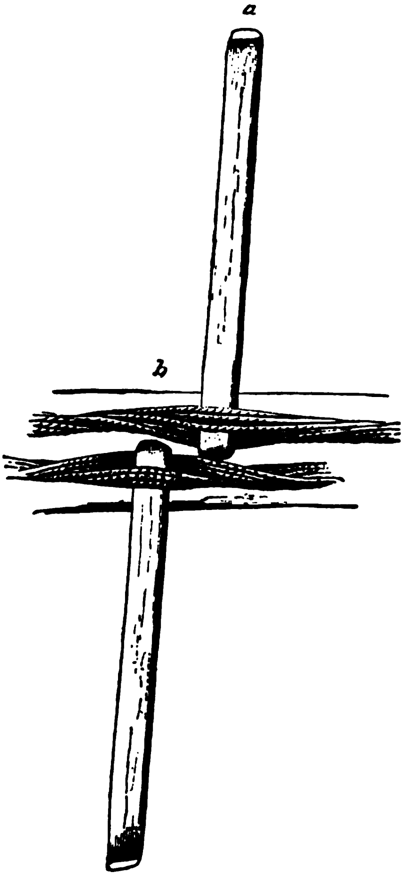


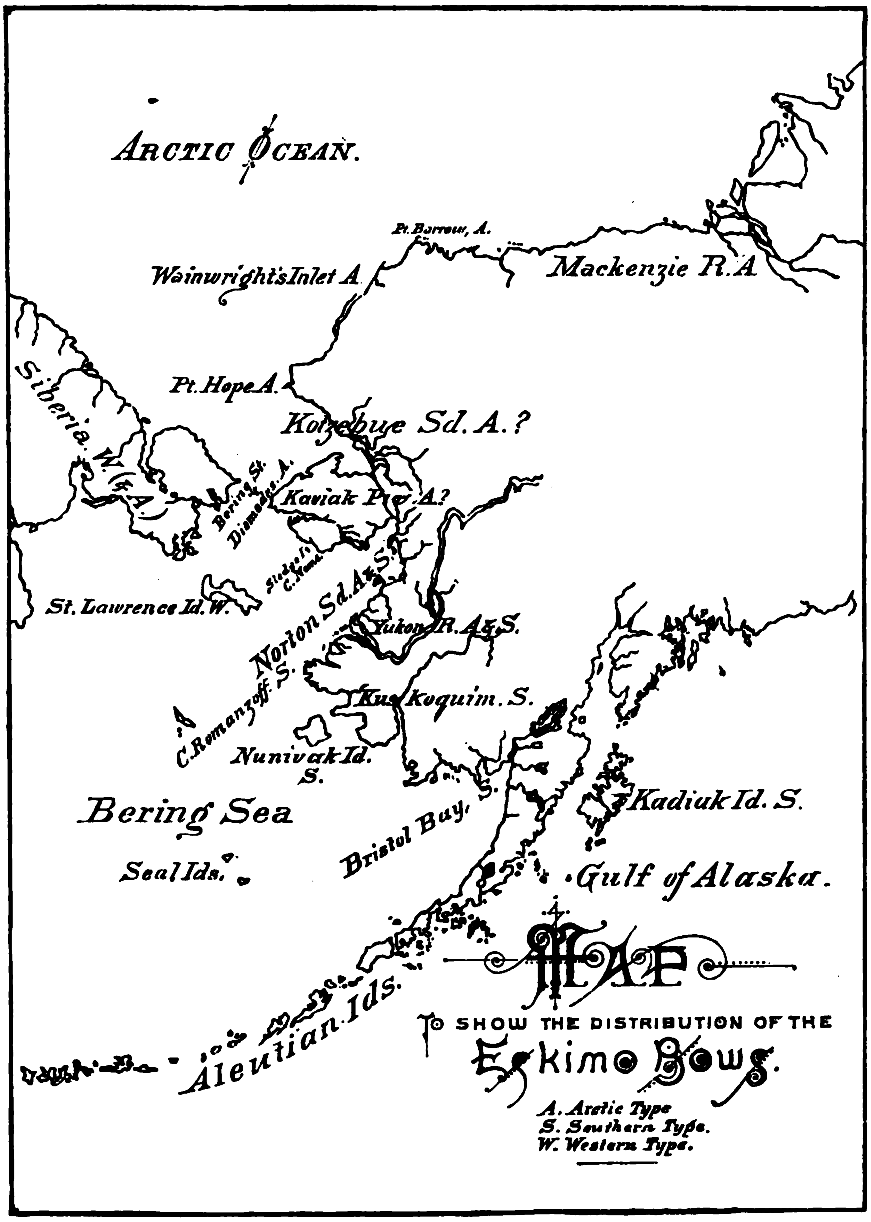
FIG. 29.

PLATE XII.

(Murdoch. Eskimo bows.)

A map to illustrate the distribution of Eskimo bows in Alaska and the neighboring regions. (A tracing, with some modifications, from Mr. Dall's "Alaska and the Adjoining Region.")

PLATE XII.


Arctic Ocean.
Pt. Barrow, A.
Wainwright's Inlet A.
Mackenzie R. A
Pt. Hope A.
Kotzebue Sd. A.?
Siberia. W. (& A.)
Bering St.
Diomedes. A.
Kaviak Pen. A.?
Sledge I.
C. Nome
St. Lawrence Id. W.
Norton Sd. A & S.
Yukon R. A & S.
C. Romanzoff. S.
Kuskoquim. S.
Nunivak Id. S.
Bering Sea
Seal Ids.
Bristol Bay. S.
Kadiak Id. S.
Gulf of Alaska.
Aleutian Ids.
MAP
TO SHOW THE DISTRIBUTION OF THE
Eskimo Bows.
A. Arctic Type
S. Southern Type.
W. Western Type.

IV.—ON A SPOTTED DOLPHIN APPARENTLY IDENTICAL WITH THE PRODELPHINUS DORIS OF GRAY.

By Frederick W. True.

Upon the return of the U. S. Fish Commission steamer Albatross from an expedition to the island of Cozumel, in the spring of the present year, the naturalists attached to the vessel informed me that while in the Gulf of Mexico they fell in with a large school of dolphins of very peculiar appearance, the back being covered with white spots. The descriptions of the animal aroused my curiosity, and at my suggestion Professor Baird, Secretary of the Smithsonian Institution, immediately offered a reward for the capture of one or more individuals of the species. Messrs. Warren and Stearns, fish dealers of Pensacola, Fla., very kindly offered to direct the attention of the fishermen to the matter, and so efficient were their services that on the 3d of June, only a few weeks after the presence of the species in the Gulf was first made known, we received by steamer an adult male in perfect preservation.

Judging from the remarks of the naturalists of the Albatross, and the fact that a specimen was so quickly secured by the Pensacola fishermen, it would appear that the species is abundant in the Gulf. Furthermore, upon the return of the Albatross from a cruise on the Hatteras ground, only a few days after the Pensacola specimen was received, I was informed that great schools of a spotted dolphin, apparently identical with the latter, were seen in that locality. Two individuals, in fact, were harpooned, but broke away and sunk before they could be hauled up to the deck of the steamer.

The Pensacola dolphin was certainly the most beautiful cetacean I have ever examined. The outlines of the body were very graceful, and the gray tints of the sides and the spots on the lower surfaces exquisitely delicate. Upon the first superficial examination I was convinced that I had before me a representative of the genus *Prodelphinus*, but to reach a conclusion concerning the species was a far more difficult matter. In the title of this essay I have adopted the name of *P. doris*

(Gray). My reasons for so doing will be presented after the characters of the exterior and skeleton have been described.

EXTERNAL MORPHOLOGY.

An adult male dolphin 85 inches in length. The general conformation of the body is similar to that of *Delphinus delphis*, but the dorsal fin is higher and more arched, the pectoral fins are somewhat broader, and the tail is deeper at the insertion of the flukes. The snout (the upper and lower jaws taken together) is of moderate length, stout, and about a third deeper than broad. The lower jaw does not project beyond the upper. The outlines of the lips are slightly concave. The pectoral fins and the flukes present no peculiarity of form, being gently and evenly convex anteriorly, and similarly concave posteriorly, and obtusely pointed at the tip. The dorsal is strongly bent backward, a line connecting the tip and center of the base, when prolonged making an angle of 45° with a line connecting the extremity of the beak and the notch of the flukes. The anterior margin is straight in the lower three-fourths of its length, then rather strongly curved backward; the concavity of the posterior margin forms an arc of a circle.

The distribution of color is peculiar and somewhat difficult to describe. Beginning at the base of the dorsal fin and passing downward the color is first dark purplish slate, and becomes gradually lighter until the middle of the side is reached. At this latter point it grades somewhat more rapidly into the pure white of the belly. From the line of the anus backward, and from the region of the pectoral fin forward, the dark color of the back extends down much lower. There is no pure white posterior to the anus. The dark color involves the head and beak and the extremity of lower jaw. It also borders the sides of the latter to a depth of two or three inches. The entire body is covered with spots of dark and light color, the largest of which are about 18^{mm} in length. A line connecting the center of the base of the dorsal fin with the median line of the belly is twenty-two inches in length. Beginning at the top, in the first four inches the body is about free from spots; the next seven inches are occupied by large, light, slate-colored spots on a dark ground; and the remaining eleven inches are occupied by large, dark, slate-colored spots on a light ground. Speaking generally, where the body is dark the spots are light, and *vice versa*. This is true of the dark post-anal region and the head. The flukes, dorsal fin, and pectoral fin are dark like the back, and all are covered with small light-colored spots. The latter are scarcely perceptible on the flukes. Upon examination of the plates, especially that showing the under side of the body, it will appear that the dark spots, which are roughly elliptical in outline, change direction in different regions of the body. Beginning on the inferior surface of the lower jaw, it will be observed that the axes of the spots converge toward the median line of [illegible] far as a point slightly anterior to the pectorals; then they diverge abruptly to the line of the hinder edge of the pectorals, posterior to which the spots of the sides again converge toward the median line. On the sides there is a similar change of direction, which is especially noticeable over the pectoral fin. It is to be remarked that there is a similar change in direction in the lines of light color on *D. delphis* and other species.

Measurements of the exterior of Prodelphinus doris, No. 15030, ♂.

	Centimeters.
Total length	215.7
Length of mouth	28.0
Extremity of snout to eye	33.7
Extremity of snout to blow-hole	34.7
Extremity of snout to anterior base of pectoral fin	50.7
Extremity of snout to anterior base of dorsal fin	104.5
Extremity of snout to anterior end of genital slit	134.3
Extremity of snout to anus	153.5
Length of pectoral fin	30.4
Greatest breadth of pectoral fin	12.6
Width of base of pectoral fin	11.9
Distance between bases of pectoral fins on under side of body	21.3
Length of genital opening	13.9
Length of anus	2.0
Breadth of flukes	52.7
Depth of flukes	16.0
Length of anterior margin of dorsal fin (following curve)	44.3
Vertical height of dorsal fin	24.1
Length of base of dorsal fin	36.7
Length of beak	12.7
Length of eye	2.8
Breadth of blow-hole	2.5

OSTEOLOGY.

The skull has the form of the type specimen of *Prodelphinus doris*, with which the species is believed to be identical. The length of the beak is a little less than three-fifths that of the skull; its width at the middle is one-eighth the total length. The intermaxillaries are high and rounded. The palate is generally flat, but with a deep channel in the median line anteriorly, in which the vomer becomes visible. The pterygoids, which meet in the median line, are very long, making the distance from their extremity to the tip of the beak three-fourths the length of the skull. They stand on a raised table 3.3^{cm} broad. The prenarial triangle is short (about 7.6^{cm}), depressed, and rugose in the anterior part. The temporal fossæ are large and rounded. Teeth $\frac{37-37}{34-33}$; the crown of the largest tooth $.8^{cm}$ long, $.5^{cm}$ in diameter at the base. They are slightly worn at the tips.

The vertebral formula is as follows: C. 7; D. 14, L. and Ca. 48 = 69. The atlas and axis are united, but the remaining cervicals are free. Except that the neural spine of the atlas is not bifurcated, the cervical vertebræ present no salient characters by which they could be distinguished from those of *D. delphis.* The inferior transverse process of the sixth cervical is large and hamular.*

The neural spines of the dorsal vertebræ are somewhat broader than in D. *delphis*, but otherwise the vertebræ resemble those of that species very closely. The first five pairs of ribs possess heads, which touch the centra of the vertebræ. Anterior zygapophyses become obsolete at the thirtieth vertebra (counting from the atlas). They begin again at the fortieth vertebra. There are nineteen chevrons, the first of which is attached to the fortieth vertebra.

The sternum consisted originally of three pieces, but the first two are anchylosed together. The scapula is very similar to that of *P. marginatus* as figured by Messrs. Van Beneden and Gervais (Osteog. des Cétacés, pl. XL, fig. 23), except that the acromion is considerably more expanded.

The formula for the phalanges is as follows: I, 2; II, 9; III, 7; IV, 3; V, 1. The position of the metacarpal of the pollex is somewhat peculiar. It does not form a part of the radial margin of the hand, but its outer border is in a line with the median axis of the first phalanx. On the outer surface of the carpus a small bone is visible, situated between the metacarpals of the first and second fingers and the bones reckoned as scaphoid and trapezoid by Professor Flower. This should be a rudimentary trapezium if the system of Professor Flower be adopted.

The pelvic bones are about 8 centimeters in length and are sigmoid in outline.

Measurements of the skeleton.

	Centimeters.
Greatest breadth of atlas	13.2
Greatest height of atlas	9.8
Greatest breadth of first dorsal	9.2
Greatest height of first dorsal	8.4
Greatest breadth of first lumbar	19.5
Greatest height of first lumbar	14.1
Greatest length of scapula	19.7
Greatest height of scapula	14.1
Greatest length of pectoral fin	34.8
Greatest length of longest rib in straight line	30.6
Greatest length of sternum	17.5
Greatest breadth of sternum	10.4

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* I find that the possession of a large inferior transverse process is not a safe guide to the position of the vertebra in the cervical series. In a large collection of cervical vertebræ of *T. tursio*, in some cases the inferior transverse process of the fifth vertebra is greatly expanded and in other cases that of the sixth vertebra.

Measurements of the skull of Prodelphinus doris, No. $\frac{15930}{21915}$, ♂; *the type of P. plagiodon, No.* 3884; *and the type of P. doris, British Museum, No.* 352*a*.

Measurements.	*P. doris*, No. 21915, U. S. Nat. Mus.		Type of *P. plagiodon*, No. 3884, U. S. Nat. Mus.		Type of *P. doris*, No. 352a, Brit. Mus.	
	cm.	100ths.	cm.	100ths.	cm.	100ths.
Total length	46.2	100.0	43.1	100.0	39.2	100.0
Length of beak	26.9	58.2	24.3	56.5	23.4	59.9
Breadth of beak at base of notches	10.1	21.9	9.1	21.2	9.4	23.9
Breadth of beak at its middle	5.8	12.6	5.6	12.9	4.9	11.9
Breadth of intermaxillaries at same point	3.3	7.1	2.8	6.5	2.7	7.1
Greatest breadth between outer margins of intermaxillaries, proximally	8.1	17.6	7.8	18.2	7.3	18.8
Length of tooth-line	23.6	51.1	21.0	48.2	20.2	51.8
Last tooth to base of maxillary notch	5.3	11.5	4.6	10.6	4.0	10.4
Tip of beak to anterior margin superior nasal opening	32.4	70.3	28.0	65.9	26.9	68.6
Tip of beak to end of crest of pterygoid	34.7	75.2	......	......	28.7	73.1
Breadth between orbital processes of frontal	18.5	40.1	18.0	41.8	16.3	41.7
Breadth between hinder margins of temporal fossæ	14.4	31.3	14.2	32.9	13.1	33.3
Length of temporal fossa	8.1	17.6	8.1	18.8	7.1	18.1
Depth of temporal fossa	5.6	12.1	6.1	14.1	5.3	13.6
Total length of mandible	39.2	85.2	36.7	85.2	33.8	86.4
Depth between angle and coronoid process	7.3	15.9	7.1	16.5	6.0	15.5
Height of crown of largest tooth	.8	....	....	....	....	....
Greatest diameter of crown at base	.5	....	....	....	....	....
Number of teeth	$\frac{37-37}{33-34}$	....	$\frac{35-35}{34-35}$	....	$\frac{33-34}{34-34}$	....

TAXONOMY.

The majority of species of *Delphinidæ* are founded upon single skulls. All dolphins' skulls differ from one another to a greater or less extent, and it is impossible, therefore, to find any which will agree exactly with the types. Furthermore, the limits of cranial variation have been determined only in the case of two or three well-known species. For these reasons there is a strong temptation, when a fresh specimen of which the external characters are undescribed is acquired, to erect a new species. The skull presents differences which separate it from the type skulls of any previously described species, and there is no criterion by which one may judge whether these differences are of specific value or only represent individual variation. Such is especially the case in the genus *Prodelphinus*, in which the species may be as few as three or four or as many as twenty or twenty-five.

Under these circumstances there is no escape from a very unpleasant dilemma. If a new species is erected, there is constantly a suspicion that it is identical with some one previously described from the skull; while, on the other hand, if the newly-acquired specimen is referred to a species already in the literature, there is always the possibility that if the external characters of the latter were known they would prove the two to be distinct. It is seldom that cetologists have the opportunity to compare large numbers of individuals of the same species in a fresh state, except in the case of such forms as *Globiocephalus*, of which large schools are frequently stranded. It is imperative that we should make careful study of such material, and from the results of such investigation draw our opinions regarding the variations of other species. In the present instance it is hoped that a considerable number of crania may be secured at no distant day.

What has been said concerning species described from single skulls holds true for species described from external characters only, and of which no measurements are recorded or specimens preserved. It is doubtful whether such species should be recognized.

At least three species have been described which, so far as external appearance is concerned, bear a more or less close resemblance to the specimen under consideration.

First may be mentioned the *Delphinus maculatus* of Lesson and Garnot, (Zool. Voyage Coquille, p. 183), seen in the vicinity of the Society Islands. This quondam species has the sides and belly impure grey, with rounded white spots margined with rose-color. As this is one of the species *vus en mers et dessinés à distance*, it is scarcely worthy of serious consideration, but it is evident that even so far as the spots are concerned—the only definite character given—it bears no close resemblance to the Pensacola dolphin, and it may therefore be dismissed.

Another spotted species is the *Delphinus Boryi* of Desmarest (Mammalogie, p. 513), from Madagascar. Its colors are thus described: "Dessus du corps d'un gris de souris fort tendre; dessous d'un gris très clair, avec des taches, peu tranchées, d'un gris-bleuâtre; côtés de la tête d'un blanc d'ivoire, nettement séparé par une ligne droite, de la couleur du dessus." The color of the head and of the spots is evidently quite different from that of the specimen under consideration.

A third species, with a spotted skin, is the *Delphinus Pernetyi* of Desmarest (Mam., p. 513). Pernety's figure, though somewhat crude, evidently represents a species whose coloration is similar to that of our Pensacola dolphin. The transition from light to dark color is represented as very abrupt, the light color involves the eye and the beak, and the back is without spots, in all of which characters Pernety's dolphin differs from that represented in the plates accompanying this essay. The last character, however, seems to be of little significance. I was informed by one of the naturalists of the Albatross that in the schools seen off Hatteras the young animals were not spotted on the back.

If our Pensacola specimen is to be accredited to any species known only by the exterior, I believe it should be to this *D. Pernetyi*. As no portions of the animal were preserved, however, and no diagnosis or measurements were given, I think it undesirable to withdraw the species in question from the list of *espèces douteuses*.

There is at least one other species which seems to bear some relation to that under consideration. This is the *Delphinus punctatus* of Gray. A skeleton, drawing and measurements of this animal are preserved in the Public Museum of Liverpool, where I examined them in the winter of 1883–'84. Gray's figure (Cat. Seals and Whales, p. 399) is a correct reproduction of the somewhat crude original. The whole lower part of the body, including the pectorals and beak and a band over the tail, is represented as being of a very dark stone-color, while the upper half is black. The whole body is sparingly covered with irregular white spots. In having light-colored pectorals and beak and a lunate band of light color over the tail, this animal appears to differ from the Pensacola specimen. The skulls are quite similar, but the beak is longer and narrower in *D. punctatus* and the teeth are more numerous ($\frac{43-42}{41-40}$). The skeleton, on account of restricted time, I was unable to examine in detail.

A comparison with the species known only from the skull is not entirely satisfactory. The Pensacola specimen is identical, in the first place, with the *D. plagiodon* described by Professor Cope in 1866 (P. A. N. S. P., 1866, p. 296) from a single skull, without locality, contained in the collections of the National Museum. I have compared the two skulls with each other and can find no differences of importance. (See measurements, p. 321.) *D. plagiodon*, however, as Professor Cope himself suspected, would appear to be identical with *Prodelphinus doris* (Gray). (See measurements, p. 321.)

The type of the latter species is considerably smaller than that of *P. plagiodon*, but agrees with it closely in detail. So far the identification is reasonably sure, and it is, perhaps, best that we should not attempt to seek an earlier name. If we do we fall inevitably into perplexity. There are a number of skulls in the Paris Museum labeled *P. dubius*, which, as Professor Flower has already pointed out, show a great similarity to the type of *P. doris;* but we do not know to which particular specimen Cuvier first applied the name, and his description is too vague to be of any value where closely allied species are concerned. Furthermore, the skulls labeled *P. dubius* agree with others bearing different names, notably with one called *P. brevimanus*, of which the external form and color were made known by Hombron and Jacquinot (in Voyage de l'Astrolabe, Zool., 1840, pl. 21), and of which the skeleton and skin are still preserved. In color and number of vertebræ this specimen does not agree with our Pensacola animal, and thus we find that our chain of resemblances will not meet at the ends. The case is the same upon comparing *P. frœnatus*, *P. frontalis*, and other species. We are forced, therefore, to fall back on *P. doris*, the earliest described species with which our specimen can be satisfactorily identified.

Diagnosis of the species.

PRODELPHINUS DORIS (Gray) Flower.

Delphinus Doris, Gray, Zool. Ereb. & Terr., 1846, p. 39, pl. xx.
Delphinus (*Cephalorhynchus*) *Doris*, Gray, Cat. Mam. Brit. Mus., Cetacea, 1850, p. 114.
Tursio Doris, Gray, Cat. Seals & Whales, 1866, p. 255.

Clymenia Doris, Gray, Synopsis Whales & Dolphins, 1868, p. 6.
Prodelphinus doris, Flower, List of Cetacea Brit. Mus., 1885, p. 29.
Delphinus plagiodon, Cope, Proc. Acad. Nat. Sci. Phila., 1866, p. 296.

FEMALE ?

MALE—*Exterior.*—Form of *D. delphis*, with higher and more arched dorsal fin and broader pectoral fins. Back, dorsal fin, flukes, upper part of head, and pectoral fins dark slate-color, growing gradually lighter on the sides. Belly and lower half of sides white. The dark-colored upper half of the body, tail, and fins spotted with white or light slate-color; light-colored lower half spotted with dark slate-color.

Skull.—Length of beak three-fifths and width at middle one-eighth length of skull. Intermaxillaries high and rounded. Prenarial triangle short, depressed, rather less than one-third the length of the beak. Temporal fossæ large, rounded, their length about one-eighth that of the skull. Teeth $\frac{37}{34}$.

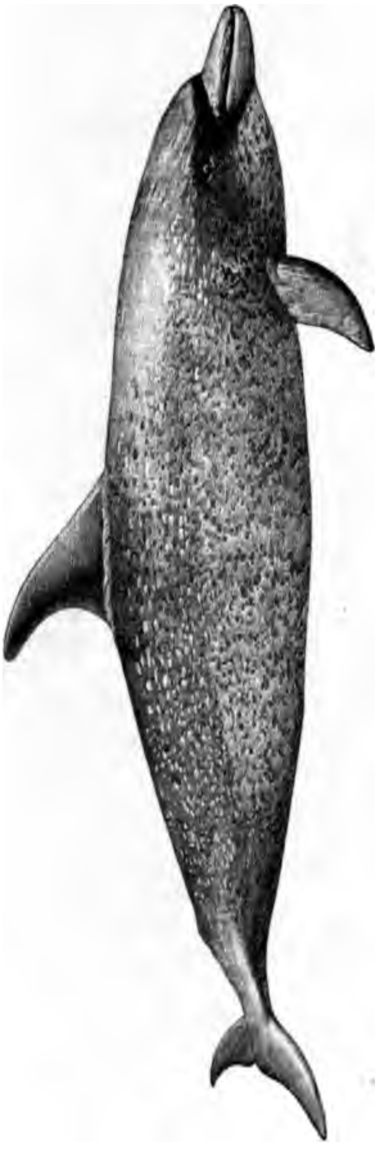
Skeleton.—Vertebral formula: C. 7; D. 14; L. and Ca. 48=69.

During a superficial examination of the viscera no especial peculiarities were noticed except so far as the penis was concerned. This organ, instead of having the tapering form common among the dolphins, is lingulate, strongly flattened, and obtusely pointed. The orifice is inferior.

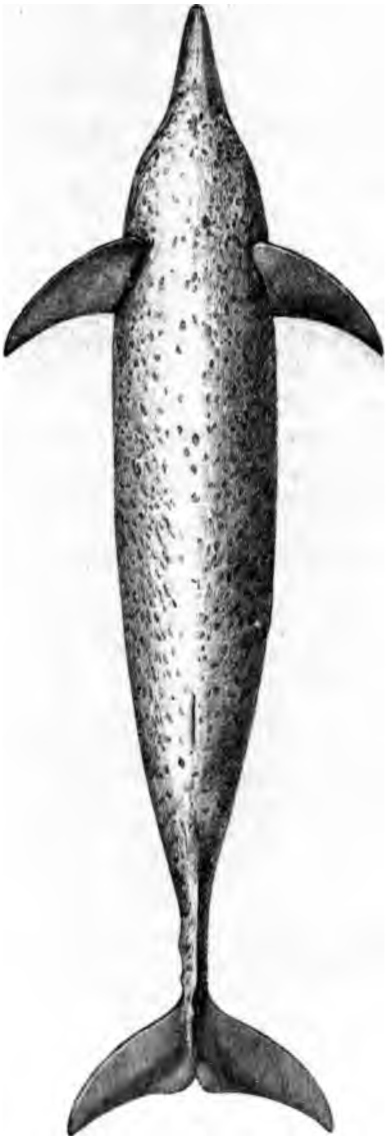
The testicles were of immense size, showing that the animal was captured in the rutting season. They measured 30^{cm} in length.

The intestine measured 60 feet in length, and is, therefore, short compared with *Tursiops tursio*, *Delphinus delphis*, and some other species. The stomach, which was of the normal form, was filled with the bones of the scuppaug (*Stenotomus*) and a species of sea-robin (*Prionotus*).

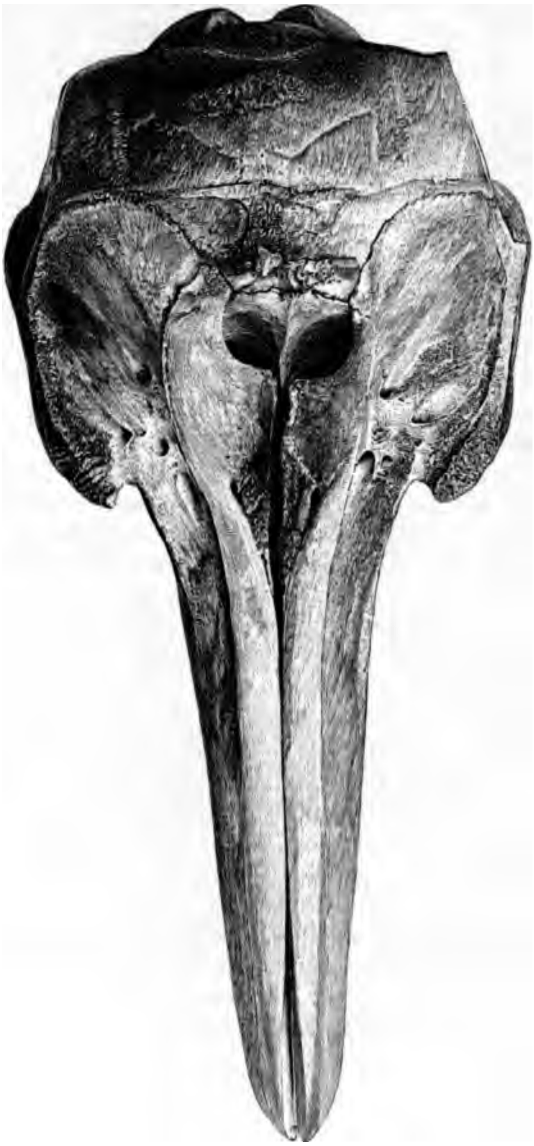
The animal had met with a severe accident in the course of its career, the fifty-fourth to the fifty-seventh caudal vertebræ being broken and soldered together. The margin of the caudal peduncle above these vertebræ was broken by deep grooves, and a swelling of considerable size was visible on its side.



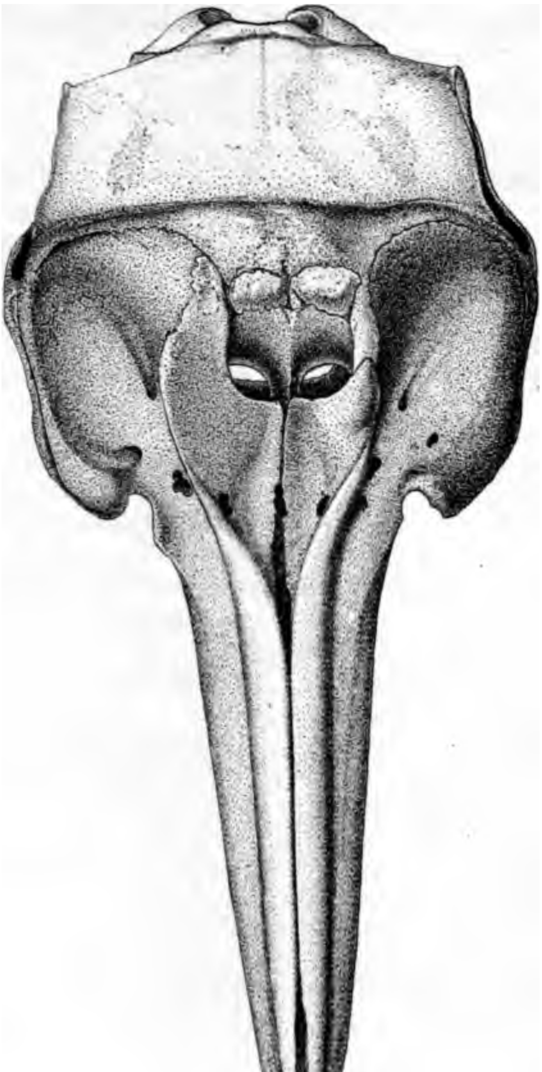
Prodelphinus doris, Gray. Lateral view.



Prodelphinus doris, (Gray). View from below.



Skull of *Prodelphinus doris*, (Gray). View from above.



Skull of *Prodelphinus plagiodon*, (Cope). Type. View from abov

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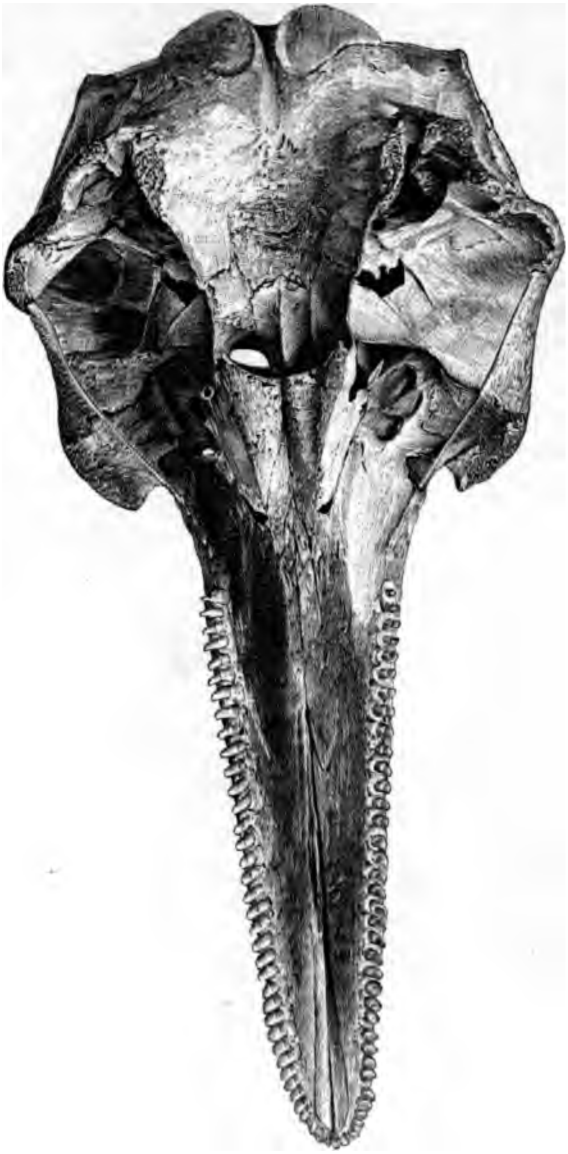
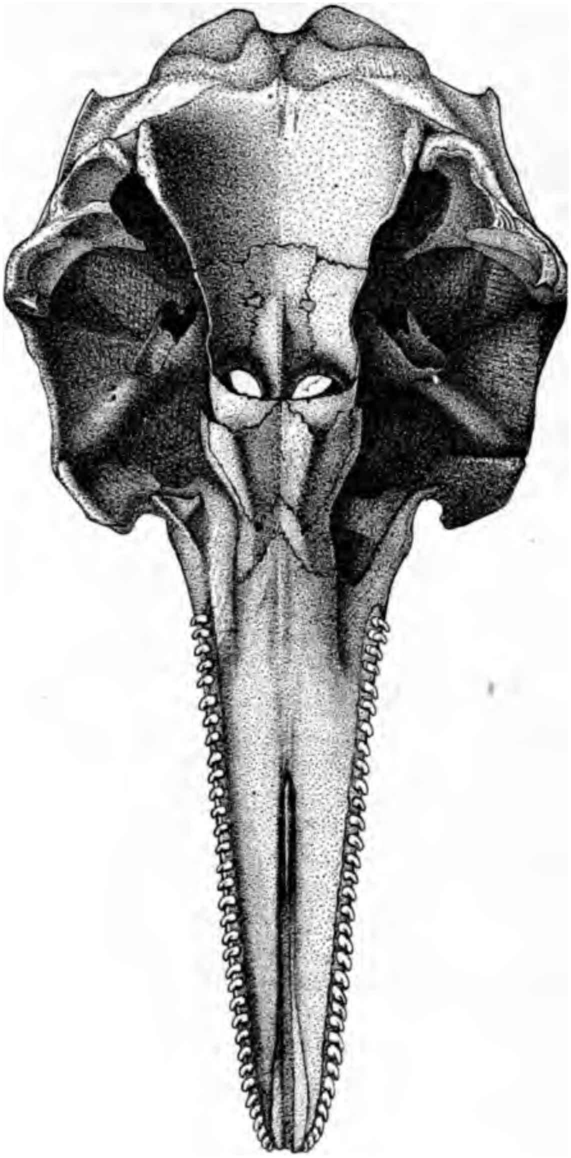


Skull of *Prodelphinus doris*, (Gray.) View from below.



Skull of *Prodelphinus plagiodon*, (Cope). Type. View from below.

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V.—THE FLORIDA MUSKRAT (NEOFIBER ALLENI, TRUE).

By FREDERICK W. TRUE.

In the summer of 1884 I made known for the first time the characteristics of a peculiar rodent, a single specimen of which was received from Florida in December of the previous year.* No additional specimens of the animal have been thus far received, nor any new information regarding its habits and distribution. It is my purpose in this paper simply to describe in detail the superficies and skeleton of the original specimen and to discuss its generic and specific characters.

The type specimen was procured by William Wittfeld, Esq., a correspondent of the Smithsonian Institution, in the vicinity of Georgiana, Brevard County, Florida. Georgiana is situated on Merritt's Island, at the northern extremity of Indian River, nearly opposite Cape Canaveral. The island is about 35 miles in length from north to south, and some 5 or 6 miles in breadth at the widest part. It is separated from the mainland by a strait about 5 miles in breadth.

The collection in which the round-tailed muskrat was found contained representatives of *Mus rattus*, *Hesperomys leucopus*, *Scalops aquaticus*, and a species of *Sorex*.

NEOFIBER, True.

Neofiber, Science, iv, 75, p. 34, July 11, 1884; Proc. U. S. Nat. Mus., vii, p. 170, July 29, 1884.

Form, arvicoline. Tail nearly as long as body, terete, nearly naked. Hind toes in a line with the metatarsals, scarcely webbed. Thumb with a claw.

Anterior cusps of molars rounded interiorly, acute externally. Last lower molar with 4 cusps, re-entrant angles alternating.

Parietals widest in front, but with an angular postero-lateral extension. Interparietal wider than long. Surface of mastoid not deeply concave.

Pelvis and pes not longer than skull. Transverse processes of lumbar vertebræ short; those of the caudal vertebræ, except the first four, rudimentary. Vertebræ: C. 7; D. 13; L. 6; S. 4; Ca. 25 = 55.

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* Science, iv, No. 75, July 11, 1884, p. 34. Proc. U. S. Nat. Mus., vii, 1884, pp. 170–172 (July 29).

NEOFIBER ALLENI, True.

Neofiber Alleni, True, Science, iv, No. 75, 1884, p. 34; Proc. U. S. Nat. Mus., vii, 1884, p. 170.

A muskrat of less than half the size of *Fiber zibethicus*, but of the same general form. Eyes small and high up on the head. Ears moderate, broad and rounded, hirsute within the conch, the longest hairs extending 0.8^{cm} beyond the margin. Border of the conch slightly and unevenly notched. Fore feet as in *F. zibethicus*. Palm black, except the two large posterior tubercles and the base of the thumb. Hind feet moderate, not equaling twice the length of the fore-feet. Soles naked, smooth, black, and 5-tuberculate.

The posterior internal tubercle large and oval in outline. The remaining four, situated respectively at the angle between the 1st and 2d toes, between the 2d and 3d, between the 3d and 4th, and between the 4th and 5th; all small and of equal size. Soles narrow. Toes not inclined laterally at an angle with the sole. Fringe of the toes and sole not extending prominently below the plane of their lower surface.

Toes of the fore and hind feet only slightly webbed. Claws horn-colored. Tail round, about 0.6^{cm} in diameter at the base and tapering gradually to the tip. Sparsely clothed with short blackish hairs, between which the tail appears covered with rows of scales, as in *Mus*.

Color of the hair of the body above as in *F. zibethicus;* rich rufous at the upper two-fifths and lead-color at the base. In a small area just behind the shoulders the base of the hairs is white. Color of the head the same as of the body, but darker. Hair of the under surface of the body light rufous at the upper third, lead-color at the base. Chin, throat, and inner side of the fore arms and legs white or but faintly tinged with rufous. Fore and hind feet above clothed with short, dull, brown hairs, which extend to the tips of the toes.*

Throughout its entire structure the Florida muskrat displays an affinity to *Fiber* on the one side and to *Arvicola* on the other. It is strictly intermediate between the two genera.

In general shape the skull deviates in no manner from that of *Fiber*. The lachrymal pit is less inflated in *Neofiber* and the nicking of the root of the zygoma in front less obvious. The interorbital area is less constricted posteriorly, its sides being nearly parallel. The squamosals are much smaller than in *Fiber*, and do not approach so near the median line anteriorly. The parietals, on the contrary, are large, and, taken together, heart-shaped, the apex turned backward and truncated. There is a small, regularly triangular, postero-lateral extension. The interparietal is broader than long. The zygomatic arches are similar to those of *Fiber*. Between the maxillary and squamosal processes externally the malar is reduced to a mere thread, as in that genus.[*]

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* *This description* is a repetition of that given in the Museum Proceedings (l. c.).

The strap-shaped process of the squamosal bounding the squamosal fenestra stands nearly vertically, and the constriction of the skull between the fenestræ is less than in *Fiber*. The anterior margin of the *meatus auditorius* is much less prolonged than in that genus. The bullæ are more inflated. The surface of the mastoid is uneven, but not strongly concave; the foramen very small.

The coronoid process of the mandible is not as high as the condyle, but the jaw is not otherwise different from that of *Fiber*.

The anterior upper molar has five cusps, the first not wider than the other, nor compressed. The second molar has four cusps, the anterior largest, acute externally, rounded internally. The posterior molar has four cusps, the anterior like that of the preceding tooth, the second and third equal in size, the last half-halberd-shaped, and almost or quite external to the median line of the series. The anterior lower molar has seven cusps, the first irregularly halberd-shaped, the last almond-shaped, the rounded end internal. The second tooth has five cusps. The last has four cusps, of which the first three are very small and the last rhomboidal.

The skeleton presents a number of peculiarities, aside from proportions, which distinguish it from that of *F. zibethicus*. The inferior lamella of the transverse process of the sixth cervical vertebra is short and broad, and does not extend back under the head of the first rib, as in *F. zibethicus*. The neural spines of the dorsal vertebræ are much higher than those of the lumbar vertebræ, the reverse being true in the case of *Fiber*. Of the six segments of the sternum the fifth is the smallest, being one-half as high as broad. The transverse processes of the lumbar vertebræ are short, and do not extend to the level of the under side of the centra. The processes of the caudal vertebræ, after the fourth, are rudimentary; the vertebræ themselves are much elongated.

The anterior extremity presents no special distinguishing characteristics. In the pelvis the acetabulum is situated at the junction of the third and fourth fifths of its length. There is less difference in the osseous structure of the feet of the two muskrats than one would suppose from an examination of the exterior. The peculiar bending of the toes in *Fiber* appears to be due to muscular and ligamentary antagonism rather than to any peculiarities in the arrangement of the bones of the foot. In *Neofiber* the fifth metatarsal is not more than one-half as long as the second, and the first is but little longer. In *Fiber* the second toe is shorter than the third, and the third than the fourth. In *Neofiber* the third is the longest, followed by the second and fourth.

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[*] Mr. N. P. Scudder (Proc. Biol. Soc. Washington, ii, 1885, p. lxiv) very justly takes exception to Dr. Coues's statement that in *Fiber* the squamosal and maxillary spurs are in contact on the outer side of the zygomatic arch (Monogr. N. A. Rodentia, 1877, p. 253). Such an arrangement of parts appears to exist only in exceptional cases, if at all. Among eleven skulls in the Museum collection there are none in which the two spurs are absolutely in contact, though in one the space between them is exceedingly narrow.

In external appearance the Florida muskrat somewhat resembles *Arvicola amphibius*, but it is easily distinguished by its larger head and feet, longer and less hairy tail, and heavier body. The muzzle is entirely hairy, except the small nasal pads. The eyes are noticeably nearer to the ears than to the nose. The ears are not entirely hidden by the surrounding fur. The fore and hind feet are pilous above and naked below. The palms bear four tubercles, as in *Fiber zibethicus*. They are black, except the two large posterior tubercles and the base of the thumb. The narrow soles are smooth, black, and quinqui-tuberculate. The postero-internal tubercle is large and oval in outline. The remaining four are situated in the intervals between the axils of the five toes. They are all equally small. The toes when flexed do not lie across the sole, as in *Fiber*; the fringe of the toes and sole does not extend noticeably below the plane of their lower surface.

The tail is perfectly terete, and so sparsely clothed with hairs
scales are distinctly visible.

In general color the Florida muskrat does not diff
Arvicola amphibius, but the hair is more like that of *F*
per surfaces it is plainly of two sorts. The under-f
late, not glossy, and lead-colored, except at the terminal
with it are numerous stiff, shining hairs, about a half longer,
dark at the tips and others golden. The dark-tipped
the back, but are outnumbered on the sides by the
long, glossy hairs are sufficiently numerous to give
sheen, but not such as is seen in winter specim
overhanging the lips is composed of opaque wh
hairs on the margin of the lip are dark. The
base and lighter at the extremity. None
ears. The ear-conch is clothed externally
like the under fur of the body. In the
ve the insertion of the tail, both
forming a sort of mane or
about one-fourth inch in length.
fur of the under surface
ry ligh The
lower of the
color for hairs are
terio feet the fur is
at of The long hairs exte
tinct heel. The color of the
hat rs of the sides. On the
the e, but there are fewe
of ht.

[illegible]

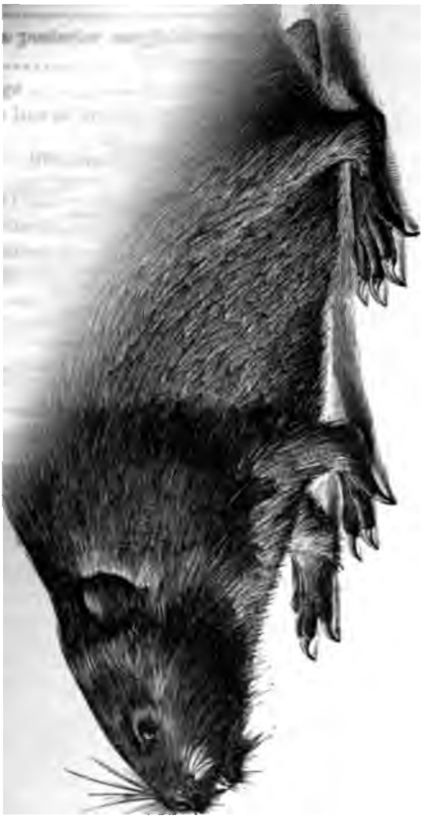
Measurements of [illegible]

Length of head and body
Length of head
Length of tail
Length of hind foot (without claws)
Length of fore foot (without claws)
Nose to eye
Nose to base of ear
Height of ear
Length of middle toe of fore foot (without claw)
Length of middle toe of hind foot (without claw)
Longest claw of fore foot
Longest claw of hind foot

[illegible]

Total length
Greatest width
Length of nasals
Length of tooth-row
Front edge of first molar
Greatest width of n
Width of interor
Center of occip

Total



Florida Muskrat. *Neofiber Alleni*, True. Type.

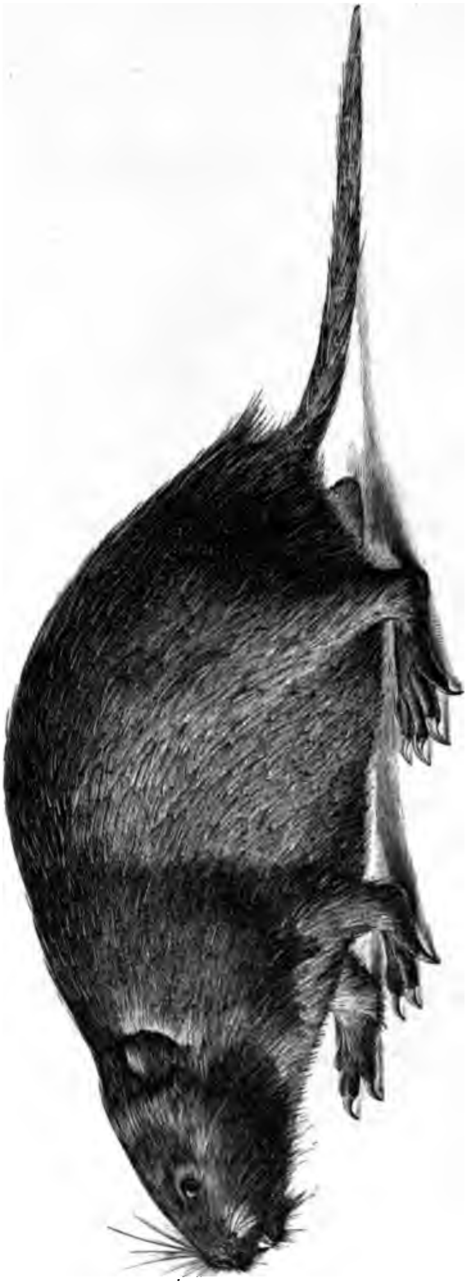
One half natural size.

Upon the discovery of a new form having a terete tail, simple feet, and four cusps in the posterior lower molar, the re-entrant angles being alternate, the question at once arises as to the validity of these characters as generic distinctions. In introducing *Neofiber* into the system several plans are open for adoption. The new form might be made a subgenus under *Arvicola* by degrading the characters drawn from the last lower molar to subgeneric rank. On the other hand, it could be introduced as a subgenus, or even species, under *Fiber* by degrading the characters derived from the tail and feet in the same manner to subgeneric or specific rank. Again, the genus *Arvicola* might be enlarged to include *Arvicola*, *Neofiber*, and *Fiber* as subgenera. Finally, the round-tailed muskrat might be made the type of a new genus intermediate between *Arvicola* and *Fiber*.

The last-mentioned course is, to my mind, the most satisfactory, and I have therefore adopted it. With the present absolute incommensurability of genera, I see no especial advantages, except in certain extraordinary cases, in introducing a grade between genus and species. On the other hand, no one probably would seriously consider the proposition of placing *Neofiber* as a species under *Fiber*. One can conceive, however, of the existence of species of the latter genus which should differ from *F. zibethicus* in proportions, quality and color of fur, webbing of the toes, and other similar details of structure.

It is somewhat remarkable that a rodent so large as *Neofiber* should have remained unknown to American naturalists until the present. It is true that exploration has not been so active in Florida as in some other parts of the country, yet the State has been traversed many times by observant naturalists and collectors. One feels convinced that the species must be very rare or is confined strictly to a limited area. The former opinion would appear to be the correct one, since the locality from which the type specimen came is a favorite resort for sportsmen, some one of whom must have recorded the species were it very abundant.

What the habits of the Florida muskrat are can be learned only from future observations. The structure of the animal would lead one to believe that it is not so thoroughly aquatic as *F. zibethicus*.



Florida Muskrat. *Neofiber Alleni*, True. Type.

One half natural size.

PLATE II.

Neofiber Alleni, True.—Type.

Fig. 1. Skull. View from above, × 1.
Fig. 2. Skull. View from below, × 1.
Fig. 3. Mandible. Right side, × 1.
Fig. 4. Right superior molars, × 4.
Fig. 5. Right inferior molars, × 4.
Fig. 6. Front foot, × 1.
Fig. 7. Hind foot, × 1.

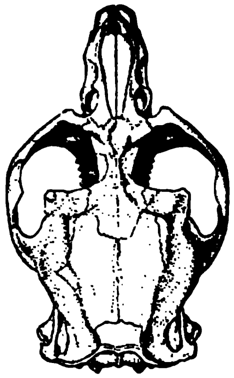


FIG. 1.

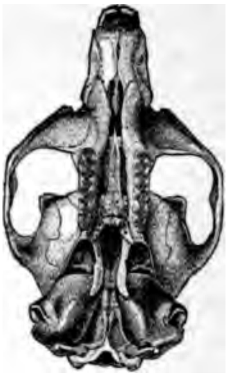


FIG. 2.

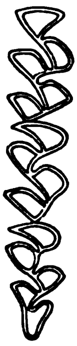


FIG. 4.

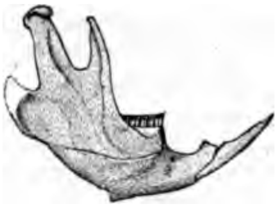


FIG. 3.

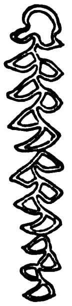


FIG. 5.

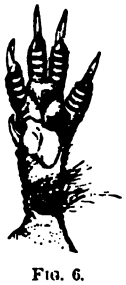


FIG. 6.

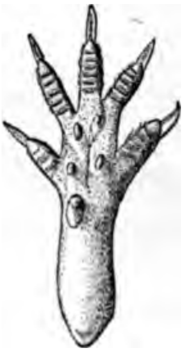


FIG. 7.

Neofiber Alleni, True.

PLATE III.

Fiber zibethicus, (Linné).

FIG. 1. Skull. View from above, × 1.
FIG. 2. Skull. View from below, × 1.
FIG. 3. Mandible. Right side, × 1.
FIG. 4. Left superior molars, × 4.

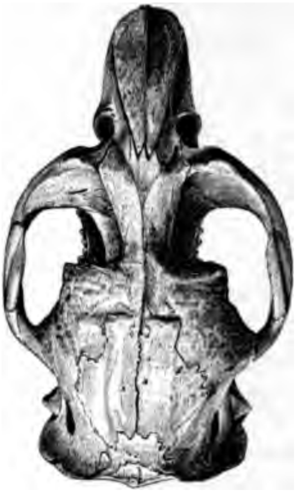


FIG. 1.

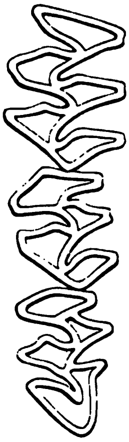


FIG. 4.

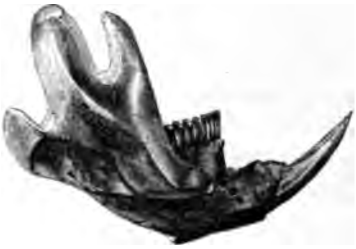


FIG. 3.

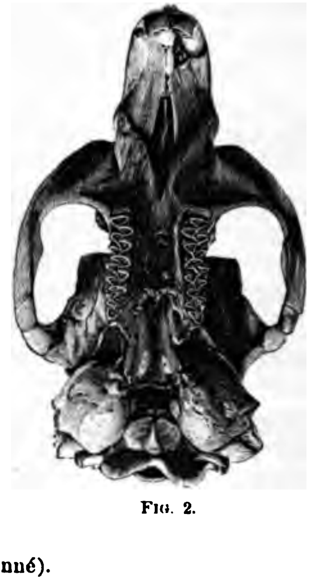


FIG. 2.

Fiber zibethicus, (Linné).

VI.—ON THE WEST INDIAN SEAL (MONACHUS TROPICALIS, GRAY).

By Frederick W. True and F. A. Lucas.

In October, 1883, the National Museum received, through the kindly offices of Prof. Félipe Poey, of Havana, Cuba, the mounted skin of a seal which had been on exhibition in that city during the summer of the same year. The seal was reported to have been captured in the vicinity of Havana. Upon arrival at the Museum it proved to be, as Poey had suspected, a specimen of the seal which Gray had provisionally referred to the genus *Monachus*, under the name of *M. tropicalis*. The skin was imperfectly prepared, and it was deemed advisable, therefore, that it should be remounted. Upon examination it was found that the skull was mounted in the skin, and that the bones of the fore and hind flippers had not been removed. Owing to this fortunate accident it is possible to describe for the first time the cranial characters of the species.

The specimen is a female, and apparently adult, though not aged. Its length, measured from the end of the tail to the extremity of the muzzle, in a straight line, is fifty-three inches.

So far as external characters are concerned, the Havana specimen agrees with the description of Gosse, published in his "A Naturalist's Sojourn in Jamaica," which appeared in 1851, and with that of Gray, founded upon an imperfect specimen now or until recently in the British Museum. It presents, however, several minor differences, the more important of which we will now proceed to discuss.

The discrepancy which first meets our attention relates to the color of the whiskers. These are stated by Gosse to be of a "black hue, with transverse bars of gray." In the specimen before us the whiskers are horn-colored, with blackish tips.

The color of the body is described by Gosse in his earlier pages as "intense and uniform black"; but subsequently, when treating of a specimen captured by Wilkie, he gives a different description, and one which, with very slight modification, is applicable to the specimen before us. The fur of Wilkie's specimen is said to have been "nearly uniform dirty ash-gray; black at the base and gray at the tips of the hairs. It is slightly mottled on the belly." In our specimen the hairs of the back and hind flippers appear light at the tip, as if faded by age; but are dark sepia-color or nearly black, except at the extremity. On the under parts and on the sides of the body, neck, and head the dark hairs are interspersed by others which are white except at the tip. The lips are bordered with white. On the upper lips the hair above the white fringe is darker than that of the surrounding surfaces. The palms are not bare, as stated by Gosse, but are equally as well clothed as the upper surfaces of the flippers. It is probable that the specimen described by Hill had worn the hair from the under surfaces of the flippers by contact with the dry surfaces of the inclosure in which it was confined.

THE SKULL.—The skull before us presents no characters which would warrant a separation of the species generically from *M. albiventer*, the type of the genus *Monachus*. The specimen agrees perfectly with the diagnosis of the genus given by Gray in the Hand-list of Seals, &c. (1874, p. 11).

In general form the skull is depressed and elongated, the breadth being exactly three-fifths the length. Compared with *Phoca vitulina*, the muzzle is much less tapering; viewed from above, its sides are approximately parallel. The intermaxillaries meet the nasals and extend along their sides for about half an inch. Nasals narrow, somewhat less than one-fourth the length of the skull, and emarginate anteriorly.

The interorbital region is broad, with parallel sides, much as in *Erignathus*. The frontals are in contact with the temporals posteriorly, and to a greater extent on the left than on the right side. The contour of the parietals is rudely square, the posterior margin being emarginate. In the specimen under consideration the sagittal and occipito-parietal sutures are still open. The sagittal and lambdoidal crests are rudimentary.

The malar rests upon the maxillary anteriorly. A line drawn from the outer edge of the canine parallel to the median line cuts the anterior end of the malar. The maxillary supports the malar internally for more than half the length of the latter. The articulation of the malar with the squamosal presents no peculiarities.

The "palate" is strongly contracted at the juncture of the anterior and middle thirds, and acutely emarginate behind. The posterior palatine foramina lie wholly in the maxillary.

The posterior nares is small; its margin forms an equilateral triangle. The narial septum is very incomplete.

The auditory bullæ are pyriform in outline and depressed, the upper surface traversed by a distinct groove. The lateral extension of the bulla forming the wall of the meatus auditorius is incomplete in front. The anterior margin of the bulla is deeply concave. The bullæ diverge strongly posteriorly.

The foramen magnum is broader than high. The paroccipitals are well developed, short, and thick.

The mandible presents some remarkable peculiarities. The condyle is very low, being on a level with the alveolar border of the jaw. The coronoid process is well developed and is strongly reflected. The lower border of the horizontal ramus is straight. The length of the symphysis is contained three and a half times in that of the jaw; the symphysis itself is very thick. The furrow below the condyle, in which the external pterygoid muscle is inserted, and which is so strongly.marked in most seals, is scarcely apparent in the specimen under consideration.

Dental formula as follows: I. $\frac{2}{2}$; C. $\frac{1}{1}$; M. $\frac{5}{5} \times 2 = 32$. The line of the upper incisors is straight. The outer incisors are much larger than the inner ones. Both pairs are unicuspidate. The inner pair has a slightly marked cingulum internally, while the cingulum is strongly developed in the outer pair. The superior canines are short, stout, and rugose, and bear a rounded ridge posteriorly. The second and third molars are set very obliquely, the anterior end being turned inward. The first and fourth molars are less oblique, the fifth not at all. The second, third, and fourth molars are approximately equal in size, the first somewhat and the fifth decidedly smaller. All the molars are very rugose, and, except the fifth, are furnished with an obtuse central cusp, supported before and behind by a smaller accessory cusp. The fifth molar has no accessory cusps. The cingulum is strongly developed in all the molars, and, except in the first, ends anteriorly and posteriorly in a small denticle. Only the posterior denticle is present in the first molar. Except between the first and second molars interspaces are wanting. The first molar rests against and is half internal to the canine. The molars are two-rooted, except the first.

The lower incisors are smaller and more obtuse than the upper incisors; the inner pair smaller than the outer, internal to the latter, and decumbent. The short canines have a posterior and two internal vertical ridges. The description of the superior molars applies equally to the inferior series, except that the fifth is larger than the first and somewhat oblique, and that there is no interspace between the first and second. The line of the inferior molars is straighter than that of the superior molars.

Comparison of M. tropicalis and M. albiventer.

If the specimen before us is adult (and the condition of the skull would seem to indicate that it is), the West Indian seal must be considerably smaller than *M. albiventer*. The female of the latter species described by F. Cuvier (Ann. Mém. d'Hist. Nat., xx, 1813, p. 387) measured 7 to 8 feet* from the extremity of the muzzle to the end of the hind flipper. In the Havana specimen the total length is but 4 feet and 10 inches.

The male monk seal described by Hermann in 1779 differed widely from the animal before us, in that the under parts were very light and that there was a large square area of soiled white on the abdomen and numerous gray spots on the head. The coloration of the female monk seal described by Cuvier (*l. c.*) approximates more closely to the specimen before us. The under surfaces of the former were yellowish light gray, while our specimen is of a yellowish umber-brown color in the same region.

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*French measure.

Much more important differences are found in the skull. In the *Ossemens fossiles* (vol. viii, 1836, p. 442–443), Cuvier gives a table of measurements of the head and other parts of the skeleton of a specimen of *M. albiventer*. Although Cuvier's specimen was larger than that under consideration, the differences are such as, in our opinion, could not be entirely due to disparity of age or difference of sex. The width of the zygomatic arch in the former is much the greater, being about three-fourths the length of the skull; in *M. tropicalis* its width is only three-fifths the same length. This character is shown also in the close approximation of the coronoid processes and condyles in *M. tropicalis*. While the length of the muzzle compared with that of the brain-case is practically equal in the two species, its width is considerably less in *M. tropicalis* than in *M. albiventer*. Both the measurements and figures of the latter species show that it has the forehead much more elevated, and consequently the anterior nasal opening more nearly vertical, than is the case in *M. tropicalis*. The foramen magnum would appear to be twice as large relatively in *M. tropicalis* as in *M. albiventer*. This character is perhaps of little value, on account of the great variability observable among different individuals.

A character which is apparently of great importance is the difference in the relative length of the molar series. In *M. tropicalis* the length of the molar series of each jaw is very nearly one-third that of the skull, while in the Mediterranean seal it is less than a fourth. The condyle of the mandible in *M. tropicalis* is noticeably low, being on a level with the alveolar border of the jaw. On account of this disposition of parts the lower edge of the occipital condyles is in the same plane with the lower margin of the mandible when the mouth is closed. There appears to be no approach to this arrangement of parts in any other earless seal.

It is stated both by F. Cuvier and by Keyserling and Blasius (Fauna Deutschland, 1857, p. 245) that in *M. albiventer* the first upper molar is the smallest of the series. In *M. tropicalis* this tooth is considerably larger than the fifth.

Cuvier has figured the skull of *M. albiventer* with a prominent supra-orbital tubercle, a process which is entirely rudimentary in our specimen of *M. tropicalis*.

In our opinion the differences pointed out are quite sufficient to warrant the separation specifically of the subtropical seals of the Eastern and Western Atlantic. It is decidedly probable that fresh specimens of equal size and age from the two regions would show differences of external proportions which cannot be determined from the scanty material now at our command.

Specific diagnosis.

MONACHUS TROPICALIS, Gray.

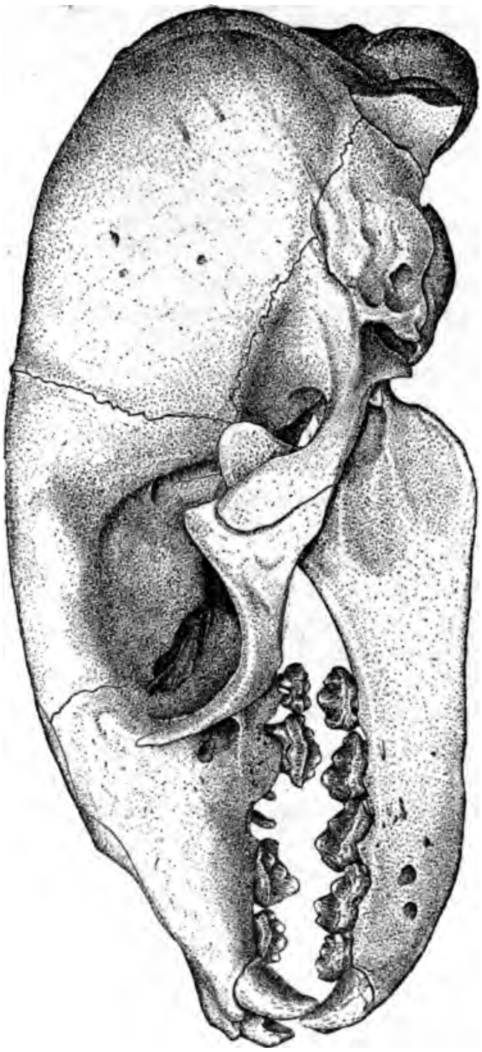
Phoca tropicalis, Gray, Cat. Mam. Brit. Mus., pt. ii, Seals, 1850, p. 28.
Phoca Wilkianus, Gosse, Naturalist's Sojourn in Jamaica, 1857, p. 308, foot-note.
Monachus tropicalis, Gray, Cat. Seals and Whales Brit. Mus., 1866, p. 20.
"*Monachus ? tropicalis*, Gray," Allen, Monogr. N. A. Pinnipeds, 1880, p. 708.

Color above umber-brown. Below slightly lighter and tinged with yellow. Flippers of the color of the back. Lips bordered with white. Soles and palms clothed with short hair.

Skull.—Forehead depressed. Condyles of mandible on a level with the alveolar border of the jaw. Length of the molar series one-third that of the skull. Last upper molar smallest.

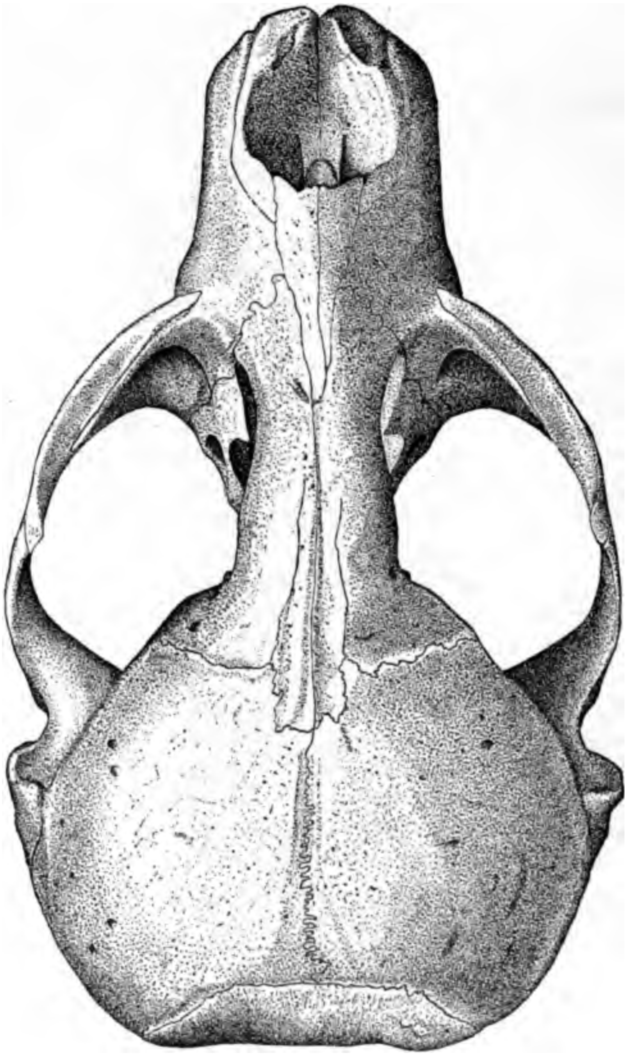
Measurements of the skulls of Monachus albiventer (from Cuvier, Oss. Foss., viii, 1836, 442) *and Monachus tropicalis.*

Measurements.	M. tropicalis.		M. albiventer.	
	mm.	100ths.	mm.	100ths.
Summit of occipital crest to anterior borders of premaxillaries	193	100.0	282	100.0
Ditto to anterior extremity of nasals	152	78.9	219	77.7
Greatest breadth between zygomatic arches	122	63.1	215	76.2
Least breadth of interorbital ridge	25	13.1	32	11.3
Breadth of muzzle on a line with the incisors	45	23.6	78	27.7
Height from lower border of occipital condyles to summit of occipital crest	70	36.3	96	34.0
From the alveolar border of the maxillary to the anterior extremity of the frontals	45	23.6	91	32.3
Height of foramen magnum	27	14.4	23	8.2
Width of foramen magnum	33	17.0	27	9.6
Length of superior molar series	60	31.5	65	23.1
Distance between outer borders of last molars	63	32.8	84	29.8
Ditto of first molars	35	18.4	48	17.0
Total length of lower jaw	134	69.7	210	74.5
Angle of mandible to upper surface of condyle	37	14.4	63	22.3
Angle of mandible to extremity of coronoid process	45	26.8	102	36.3
Distance between outer borders of coronoid processes	89	46.0	161	57.1
Distance between external extremities of condyles	112	57.8	190	67.4
Length of the symphysis mandibuli	37	19.7	58	20.6
Length of the lower molar series	60	31.5	54	19.2
Distance between outer surface of canines	27	14.4	51	18.0



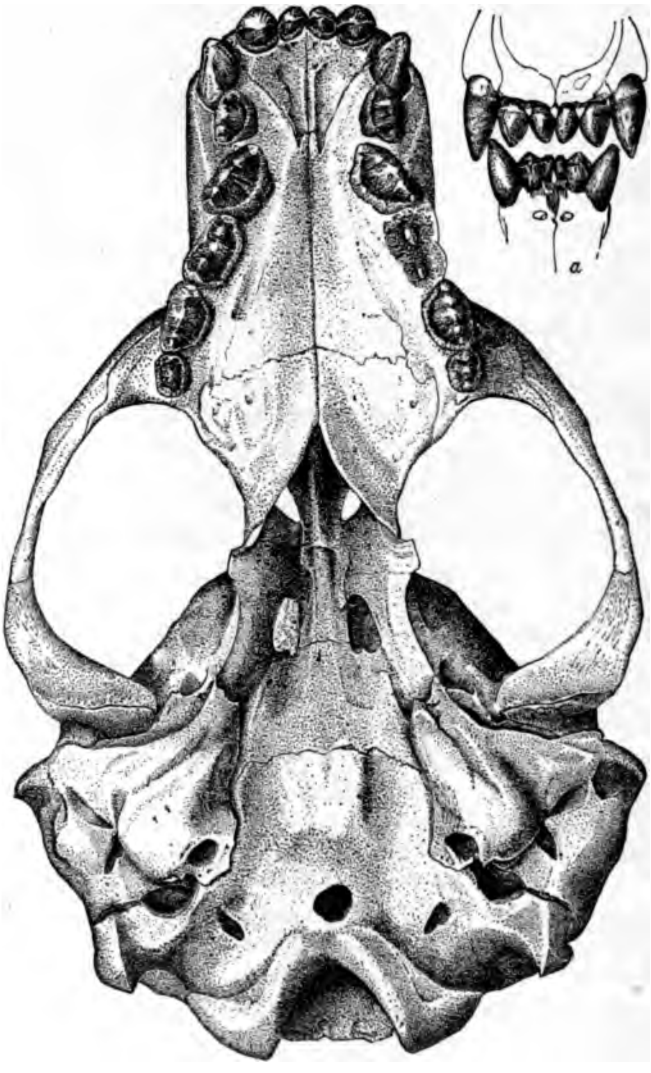
Skull of *Monachus tropicalis*, Gray. Lateral view. Two-thirds natural size.

(Drawn by F. A. Lucas.)



Skull of *Monachus tropicalis*, Gray. View from above. Two-thirds natural size.

(Drawn by F. A. Lucas.)



Skull of *Monachus tropicalis*, Gray. View from below. **Two-thirds natural size.**

a. Teeth, seen from in front.

(Drawn by F. A. Lucas.)

PART IV.

BIBLIOGRAPHY OF THE U. S. NATIONAL MUSEUM FOR 1884.

ANALYSIS.

Pages.
Part I.—Publications of the Museum 339–343
Part II.—Publications by officers of the Museum 346–370
Part III.—Publications by investigators not officers of the Museum, based on Museum material 371–381

BIBLIOGRAPHY OF THE U. S. NATIONAL MUSEUM FOR 1884.

PART I.—PUBLICATIONS OF THE MUSEUM.

The publications of the National Museum are included in two series: 1. *The Proceedings of the U. S. National Museum*, of which Vol. I appeared in 1878, and which is published in dated signatures and promptly distributed to all centers of scientific activity. 2. *The Bulletins of the National Museum*, of which 27 have been published since 1875.

These publications are printed by the authority and at the expense of the Department of the Interior.

Department of the Interior: U. S. National Museum. Proceedings of the United States National Museum. Vol. vi. 1883. Published under the direction of the Smithsonian Institution. Washington: Government Printing Office. 1884. 8vo. pp. i–vii; 1–558. Plates i–xiv.

The following is a list of signatures of "Proceedings of the U. S. National Museum," published in 1884, and forming parts of Volumes vi and vii:

Date of publication.	Signature No.	Pages.	Date of publication.	Signature No.	Pages.
VOLUME. VI.			VOLUME VII—Continued.		
April 9	25	385–400	August 5	14	209–224
April 11	26	401–416	August 5	15	225–240
April 11	27	417–429	August 20	16	241–256
			August 22	17	257–272
VOLUME. VII.			August 28	18	273–288
			August 28	19	289–304
June 3	1	1– 16	August 28	20	305–320
June 3	2	17– 32	September 1	21	321–336
June 3	3	33– 48	September 4	22	337–352
June 11	4	49– 64	September 17	23	353–368
June 11	5	65– 80	September 17	24	369–384
July 1	6	81– 96	September 17	25	385–400
July 7	7	97–112	September 18	26	401–416
July 7	8	113–128	September 19	27	417–432
July 8	9	129–144	September 26	28	433–448
July 8	10	145–160	September 27	29	449–464
July 29	11	161–176	September 27	30	465–480
July 29	12	177–192	September 27	31	481–496
August 5	13	193–208			

Report of the Assistant Director of the United States National Museum for 1882.

(Smithsonian Report, 1882 (1884), pp. 119–263.)

BULLETINS OF THE U. S. NATIONAL MUSEUM.

Bulletin of the United States National Museum. No. 25. Contributions to the natural history of the Bermudas. Volume 1. Edited by J. Matthew Jones and George Brown Goode. Washington: Government Printing Office. 1884. 8vo. pp. i–xxiii; 1–353. Plates i–xii.

Previous to the publication of the complete bulletin, there were published separately the seven parts of the bulletin, as follows:

Part I. The geology of Bermuda, by William North Rice, Ph. D., Orange Judd professor of geology and natural history in Wesleyan University. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. [1]–[32]. Plates i–vi. (S. I. Series No. 495.)

Part II. The botany of Bermuda, by General Sir John Henry Lefroy, F. R. S., Athenæum Club, London. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. [33]–[141].

Part III. The mammals of Bermuda, by J. Matthew Jones, F. R. S. C., Fern Lodge, Waterville, Nova Scotia. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. [143]–[161].

Part IV. The birds of Bermuda, by Captain Saville G. Reid, F. Z. S., of the Royal Engineers, member of the British Ornithologists' Union, &c. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. [163]–[279].

Part V. On a bird new to the Bermudas, with notes upon several species of rare or accidental occurrence in these islands, by Clinton Hart Merriam, M. D. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. [281]–[284].

Part VI. The reptiles of Bermuda, by Samuel Garman, Museum of Comparative Zoology, Cambridge, Massachusetts. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. [285]–[303].

Part VII. The annelida from Bermuda, collected by Mr. G. Brown Goode, by Henry E. Webster, professor of natural history in the University of Rochester, Rochester, New York. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. [305]–[327]. Plates vii–xii.

Bulletin of the United States National Museum, No. 27. Descriptive catalogues constituting a report upon the exhibit of the fisheries and fish culture of the United States of America, made at the London Fisheries Exhibition, 1883. Prepared under the direction of G. Brown Goode, U. S. Commissioner, and a staff of associates. Washington: Government Printing Office. 1884. 8vo. pp. i–liv; 1–1279. (S. I. Series No. 511.)

This Bulletin is composed of twelve catalogues, the first seven of which were published as separates, in 1883. Catalogue H was published as a separate in 1884. Catalogues I, J, K, and L were not printed as separates, but appeared for the first time in the complete volume.

The following is a list of these catalogues:

Great International Fisheries Exhibition. London, 1883. United States of America. A.—Preliminary catalogue and synopsis of the collections exhibited by the United States Fish Commission and by special exhibitors. With a concordance to the official classification of the Exhibition. Washington: Government Printing Office. 1883. 8vo. pp. 1–107.

Great International Fisheries Exhibition. London, 1883. United States of America. B.—Collection of economic crustaceans, worms, echinoderms, and sponges. By Richard Rathbun, curator of the Department of Marine Invertebrates in the United States National Museum. Washington: Government Printing Office. 1883. 8vo. pp. 1–31.

Great International Fisheries Exhibition. London, 1883. United States of America. C.—Catalogue of the aquatic and fish-eating birds exhibited by the United States National Museum. By Robert Ridgway, curator, Department of Birds, U. S. National Museum. Washington: Government Printing Office. 1883. 8vo. pp. 1–46.

Great International Fisheries Exhibition. London, 1883. United States of America. D.—Catalogue of the economic mollusca and the apparatus and appliances used in their capture, and preparation for market, exhibited by the United States National Museum. By Lieut. Francis Winslow, U. S. N. Washington: Government Printing Office. 1883. 8vo. pp. 1–86.

Great International Fisheries Exhibition. London, 1883. United States of America. E.—The whale fishery and its appliances. By James Temple. Brown, assistant in the Department of Art and Industry, U. S. National Museum. Washington: Government Printing Office. 1883. 8vo. pp. 1–116.

Great International Fisheries Exhibition. London, 1883. United States of America. F.—Catalogue of the collections of fishes exhibited by the United States National Museum. By Tarleton H. Bean, curator of the Department of Fishes in the United States National Museum. Washington: Government Printing Office. 1883. 8vo. pp. 1–124.

Great International Fisheries Exhibition. London, 1883. United States of America. G.—Descriptive catalogue of the collection illustrating the scientific investigation of the sea and fresh waters. By Richard Rathbun, curator of the Department of Marine Invertebrates in the United States National Museum. Washington: Government Printing Office. 1883. 8vo. pp. 1–109.

Great International Fisheries Exhibition. London, 1883. United States of America. H.—Catalogue of the aquatic mammals exhibited by the United States National Museum. By Frederick W. True, curator of the Department of Mammals, United States National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 1–22.

Great International Fisheries Exhibition. London, 1883. United States of America. I.—Catalogue of the collection illustrating the fishing vessels and boats, and their equipment; the economic condition of fishermen; anglers' outfits, &c. By Capt. J. W. Collins, assistant, U. S. Fish Commission. Washington: Government Printing Office. 1884. 8vo. pp. 1–179. [645–823.]

Great International Fisheries Exhibition. London, 1883. United States of America. J.—Catalogue of the apparatus for the capture of fish, exhibited by the United States National Museum. By R. Edward Earll, curator of the Fisheries Collections, U. S. National Museum, and assistant, U. S. Fish Commission. Washington: Government Printing Office. 1884. 8vo. pp. 1–206. [825–1030.]

Great International Fisheries Exhibition. London, 1883. United States of America. K.—Catalogue of fishery products, and of the apparatus used in their preparation. By A. Howard Clark, assistant in the Department of Art and Industry, United States National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 1–124. [1031–1154.]

Great International Fisheries Exhibition. London, 1883. United States of America. L.—Catalogue of the fish cultural exhibit of the United States Fish Commission. By R. Edward Earll, curator of the Fisheries Collections, U. S. National Museum, and assistant, U. S. Fish Commission. Washington: Government Printing Office. 1884. 8vo. pp. 1–95. [1155–1249.]

The circulars below enumerated were published as separates during the year 1884, and will appear in Proceedings U. S. National Museum, Vol. vii.

No. 24. Plan of a collection to illustrate the textile industries of the United States, to be exhibited at the World's Industrial and Cotton Centennial Exposition of 1884–1885, at New Orleans. By Romyn Hitchcock, acting curator, Section of Textile Industries. 8vo. 16 pages.

No. 25. Preliminary plan for a collection of the building and ornamental stones and rocks of the United States, to be exhibited at the World's Industrial and Cotton Centennial Exposition of 1884–1885, at New Orleans. By George P. Merrill, curator: Department of Lithology and Physical Geology. 8vo. 2 pages.

No. 26. Plan for a collection of gems and precious stones, to be exhibited at the Cincinnati Industrial Exposition and the World's Industrial and Cotton Centennial Exposition of 1884–1885, at New Orleans. By F. W. Clarke, curator, Department of Minerals. 2 pages.

No. 27. Directions for collecting, preserving, and transporting tortricids and other small moths. By C. H. Fernald. 8vo. 3 pages.

No. 28. Directions for mound exploration. By Cyrus Thomas, Ph. D. 8vo. 3 pages.

No. 29. Provisional plan for a collection of mammals to be exhibited at the World's Industrial and Cotton Centennial Exposition of 1884–1885, at New Orleans. By Frederick W. True, curator of the Department of Mammals. 8vo. 27 pages.

No. 30. A list of birds, the eggs of which are wanted to complete the series in the National Museum, with instructions for collecting eggs. By Capt. Charles E. Bendire, U. S. A., honorary curator, Section of Oölogy, U. S. National Museum. 8vo. 4 pages.

No. 31. Plan to illustrate the mineral resources of the United States and their utilization, at the World's Industrial and Cotton Centennial Exposition of 1884–1885, at New Orleans. By Fred. P. Dewey, curator: Department of Economic Geology and Metallurgy. 8vo. 8 pages.

[Circulars 19, 20, 21, 22, and 23, which are noticed in the bibliography of the Museum report for 1883, as printed in "separate" form during that year, are reprinted in Proceedings of the U. S. National Museum, vi, 1883, (1884), pp. 431–497.]

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PART II.—PAPERS BY OFFICERS OF THE MUSEUM.

WILBUR OLIN ATWATER.

The chemical composition and nutritive value of our American food fishes and invertebrates.

(Transactions American Fish Cultural Association, 1884, pp. 171-194.)

Les relations entre les plantes et l'azote de leur nourriture.

(Annales de chimie et de physique, [6] ii, pp. 322-331.)

The chemistry of the feeding of plants.

(Report of the New Jersey Board of Agriculture, 1883-1884, pp. 55-105.)
This lecture was delivered before the New Jersey Board of Agriculture.

Tables illustrative of the nutritive value of fish.

(Bull. U. S. Fish Com., iv, 1884, pp. 203-205.)

Report of analysis of a sample of fish guano made from salmon offal, by Mr. Joseph Spratt, of Victoria, British Columbia.

(Bull. U. S. Fish Com., iv, 1884, p. 238.)

SPENCER FULLERTON BAIRD,

On the specimens received by the Smithsonian Institution from the United States Life-Saving Service.

(Bull. U. S. Fish Com., iv, 1884, pp. 177-178.)

SPENCER F. BAIRD, T. M. BREWER AND R. RIDGWAY.

Memoirs of the Museum of Comparative Zoology at Harvard College. Vol. xii. The Water Birds of North America, by S. F. Baird, T. M. Brewer, and R. Ridgway. Issued in continuation of the publications of the Geological Survey of California. J. D. Whitney, State Geologist, Volume I, Boston. Little, Brown, and Company. 1884. Royal 8vo. pll. 3. pp. vii-xi, 1-537, 211 wood-cuts.

Memoirs of the Museum of Comparative Zoology at Harvard College. Vol. xiii. The Water Birds of North America, by S. F. Baird, T. M. Brewer, and R. Ridgway. Issued in continuation of the Publications of the Geological Survey of California. J. D. Whitney, State Geologist. Volume ii. Boston. Little, Brown, and Company. 1884. Royal 8vo. pll. 3. pp. 1-552. 288 wood-cuts.

These two volumes comprise a complete monograph of the Water Birds of North America, based almost wholly upon the collections of the U. S. National Museum. The technical portion was prepared by Professor Baird and Mr. Ridgway, the biographies or life-histories by Dr. Brewer (the authors having no financial interest in its publication). The work is intended as a *continuation of* "A History of North American Birds" (3 vols., embracing *the land birds)* by the same authors and publishers, issued in 1874.

TARLETON HOFFMAN BEAN.

Notes on a collection of fishes made in 1882 and 1883 by Capt. Henry E. Nichols, U. S. N., in Alaska and British Columbia, with a description of a new genus and species, *Prionistius macellus.*

(Proc. U. S. Nat. Mus., vi, 1883, pp. 353–361, Jan. 12, 1884.)

Localities and collecting dates of 48 species, one of which is a new cottoid related to *Triglops.*

Brook trout from Monadnock Lake and Cristine Lake, New Hampshire.

(Bull. U. S. Fish. Com., iv, Aug. 12, 1884, pp. 293–294.)

Notes on some fishes collected by James G. Swan, in Washington Territory, including a new species of Macrurus.

(Proc. U. S. Nat. Mus., vi, Jan. 12, 1884, pp. 362–364.)

Notes on fishes observed at the head of Chesapeake Bay, in the spring of 1882; and upon other species of the same region.

(Proc. U. S. Nat. Mus., vi, Jan. 12, 1884, pp. 365–367.)

On the occurrence of the striped bass in the Lower Mississippi Valley.

(Proc. U. S. Nat. Mus., vii, Aug. 20, 1884, pp. 242–244.)

Description of a new species of whitefish (*Coregonus nelsonii*) from Alaska.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, p. 48. Plate i.)

Descriptions of *Physiculus fulvus* and *Lotella maxillaris*, new species of fishes collected in 1881 by the United States Fish Commission.

(Proc. U. S. Nat. Mus., vii, Aug. 5, 1884, pp. 240–242.)

The white fishes of North America.

(Report American Fish Cultural Association, 1884, pp. 32–39.)

Notes on some Florida fishes (with G. Brown Goode).

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 42–47.)

TARLETON HOFFMAN BEAN AND HERMAN GEORGE DRESEL.

A catalogue of fishes received from the Public Museum of the Institute of Jamaica, with descriptions of *Pristipoma approximans* and *Tylosurus euryops*, two new species.

(Proc. U. S. Nat. Mus., vii, July, 8, 1884, pp. 151-170.)

CHARLES BENDIRE,

U. S. Army.

A list of birds the eggs of which are wanted to complete the series in the National Museum, with instructions for collecting eggs.

(Proc. U. S. Nat. Mus., vii, 1884, pp. 613–616.)

Also published as Museum Circular No. 30.

ALONZO HOWARD CLARK.

Great International Fisheries Exhibition. London, 1883. United States of America. K.—Catalogue of fishery products, and of the apparatus used in their preparation. By A. Howard Clark, assistant in the Department of Art and Industry, United States National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 1-124. (1031-1154.)

Notes on the fisheries of Gloucester, Mass.

(Bull. U. S. Fish Com., iv, 1884, pp. 401-410.)

FRANK WIGGLESWORTH CLARKE.

Plan for a collection of gems and precious stones, to be exhibited at the Cincinnati Industrial Exposition and the World's Industrial and Cotton Centennial Exposition of 1884-1885 at New Orleans.

(Proc. U. S. Nat. Mus., vii. 1884, pp. 575-576.)
Also published as Museum Circular No. 26.

Appletons' Science Text-Books. The elements of chemistry. By F. W. Clarke, chemist of the United States Geological Survey. New York: D. Appleton and Company, 1, 3, and 5 Bond Street. 1884. 8vo. (x.) pp. 1-369. 53 figures.

FRANK WIGGLESWORTH CLARKE AND THOMAS MAREAN CHATARD.

Department of the Interior. Bulletin of the United States Geological Survey, No. 9. A report of work done in the Washington Laboratory during the fiscal year 1883-'84. Washington: Government Printing Office. 1884. 8vo. pp. 1-40.

Mineralogical notes from the laboratory of the U. S. Geological Survey.

(Amer. Journ. Science and Arts, July, 1884, p. 20.)

JOSEPH WILLIAM COLLINS.

Great International Fisheries Exhibition. London, 1883. United States of America. I.—Catalogue of the collection illustrating the fishing-vessels and boats and their equipment, the economic condition of fishermen, anglers' outfits, &c. By Captain J. W. Collins, assistant U. S. Fish Commission. Washington: Government Printing Office 1884. 8vo. pp. 1-179. (645-823.)

Report of a trip of exploration on the Chesapeake Bay, made in the spring of 1882 by the steamer "Fish Hawk," Lieut. Z. L. Tanner, commanding.

(Report U. S. Fish Com., iv, 1884, pp. 1035-1038.)

Notes on the habits and methods of capture of various species of sea birds that occur on the fishing banks off the eastern coast of North America, and which are used as bait for catching codfish by New England fishermen.

(*Report U. S. Fish* Com., iv, 1884, pp. 311-338. Plate i.)

History of the tile fish.

(Report U. S. Fish Com., iv, 1884, pp. 237-294 *a*. Plates i-ii.)

Movements of mackerel in winter.

(Bull. U. S. Fish. Com., iv, 1884, p. 15.)

A large squid.

(Bull. U. S. Fish. Com., iv, 1884, p. 15.)

A search for mackerel off Block Island, Montauk, and Sandy Hook in November, 1883.

(Bull. U. S. Fish. Com., iv, 1884, pp. 49–51.)

Some observations on the cod gill-net fisheries and on preservatives for nets.

(Bull. U. S. Fish. Com., iv, 1884, pp. 56–59.)

Inauguration of the frozen herring trade.

(Bull. U. S. Fish. Com., iv, 1884, pp. 81–83.)

What codfish sometimes swallow.

(Bull. U. S. Fish. Com., iv, 1884, p. 175.)

Loss of life and property in the Gloucester fisheries.

(Bull. U. S. Fish. Com., iv, 1884, pp. 180–181.)

An adventure with a whale in the River Tay, Scotland.

(Bull. U. S. Fish. Com., iv, 1884, pp. 213–217.)

On the occurrence of corals on the Grand Banks.

(Bull. U. S. Fish. Com., iv, 1884, p. 237.)

Note on the destruction of mackerel by dogfish.

(Bull. U. S. Fish. Com., iv, 1884, p. 248.)

On the scarcity of mackerel in the Gulf of St. Lawrence.

(Bull. U. S. Fish. Com., iv, 1884, pp. 427–430.)

On the scarcity of mackerel in the Gulf of St. Lawrence.

(Bull. U. S. Fish. Com., iv, 1884, pp. 435–438.)

On the abundance of halibut near Iceland.

(Bull. U. S. Fish. Com., iv, 1884, pp. 463–464.)

Notes on certain Laridæ and Procellariidæ of the New England coast.

(The Auk, i, July, 1884, pp. 236–238.)

Our fishing vessels.

(Cape Ann Bulletin, January 9, 1884.)

Greater safety for our fishermen.

(Cape Ann Bulletin, January 16, 1884.)

The new fishing model; practical illustrations of the latest ideas in building vessels for the fisheries.

(Cape Ann Advertiser, November 7, 1884.)

Halibut on the coast of Norway.

(Cape Ann Bulletin, December 6, 1884.)

Result of the introduction of gill-nets into the American cod fisheries.

(Report American Fish Cultural Association, 1884, pp. 212–228.)

WILLIAM HEALEY DALL.

Notes on fishing products exported from San Francisco, Cal., during the year 1883.

(Bull. U. S. Fish. Com., iv, 1884, pp. 125–128.)

On the constitution of some appendages of the mollusca.

(American Naturalist, xviii (No. 8, Aug. 1884), pp. 776–778.)

Report on the mollusca of the Commander Islands, Bering Sea, collected by Leonhard Stejneger in 1882 and 1883.

(Proc. U. S. Nat. Mus., vii, Sept. 4, 1884, pp. 340–349. Plate ii, figs. 1, 2, 3, 4, 5.)

A new volcano island in Alaska.

(Science, iii (No. 51, Jan. 25, 1884), pp. 89–93.)

The false prophet of the Sudan. Review.

(Science, iii (No. 54, Feb. 15, 1884), pp. 199–200.)

A woman's journey to the Karakorum Valley. Review.

(Science, iii (No. 55, Feb. 22, 1884), pp. 228–229.)

Recent work on brachiopods. Review.

(Science, iii (No. 58, Mar. 14, 1884), p. 325.)

The state of exploration in Africa. Review.

(Science, iii (No. 61, April 4, 1884), pp. 413–415.)

Tryon's conchology. Review.

(Science, iii (No. 67, May 16, 1884), p. 601.)

Journey of Lessar to Seraks. Review.

(Science, iii (No. 68, May 23, 1884), pp. 628–629.)

Invertebrates of the Talisman expedition. Review.

(Science, iii (No. 69, May 30, 1884), pp. 657–658.)

Thouar and Crevaux. Review.

(Science, iii (No. 69, May 30, 1884), pp. 660-661.)

A new classification of the mollusca.

(Science, iii (No. 71, June 13, 1884), pp. 730–732.)

Review of the article on mollusca, by Prof. E. Ray Lankester, in Encyclopædia Britannica, xvi, p. 632, *et seq.*, 1884. See also Science, No. 81, pp. 143-144; No. 87, pp. 334-335; and No. 88, p. 351.

Headwaters of the Atna or Copper River. Review.

(Science, iii (No. 73, June 27, 1884), p. 779.)

A remarkable new type of mollusks.

(Science, iv (No. 76, July 18, 1884), pp. 50–51.)

Describes *Chlamydoconcha Orcutti* Dall, a type of new family, genus, and species from California, from specimens in the U. S. National Museum and Academy of Sciences, Philadelphia.

The new Bogosloff volcano. Review.

(Science, iv (No. 80, Aug. 15, 1884), pp. 138–139.)

The international polar stations. Review.

(Science, iv (No. 89, Oct. 17, 1884), pp. 370–372, 1 map.)

Kafiristan. Review.

(Science, iv (No. 90, Oct. 24, 1884), pp. 404–405.)

A Musselman propaganda. Review.

(Science, iv (No. 93, Nov. 14, 1884), pp. 457–459.)

Late news from the northwest. Review.

(Science, iv (No. 94, Nov. 21, 1884), pp. 474–475.)

Exploration of the Kowak River. Review.

(Science, iv (No. 98, Dec. 19, 1884), pp. 551–554.)

Pre-Historic America, by the Marquis de Nadaillac. Translated by N. D'Anvers. Edited by W. H. Dall. With 219 illustrations. New York and London. G. P. Putnam's Sons. The Knickerbocker Press. 1884. Royal 8vo. pp. x; 566.

On masks, labrets, and certain aboriginal customs, with an inquiry into the bearing of their geographical distribution.

Printed as a separate, and intended for Annual Report of the Bureau of Ethnology for 1882. 8vo. pp. 67–200. Plates v-xxix.

United States Coast and Geodetic Survey. J. E. Hilgard, Superintendent. Pacific Coast Pilot. Alaska. Part I. Price $2. Washington: Government Printing Office. 1883. pp. i–x; 1–333. Sm. fol.; 16 charts; 13 plates.

This embraces the coast of Alaska from Dixon entrance to Yakutat Bay with the Inland Passage.

Although this work was published in 1883, it was not issued until 1884.

FREDERIC PERKINS DEWEY.

A biographical sketch of the late Dr. George Wesson Hawes.

(Report, Smithsonian Institution 1882 (1884), pp. 35–38.)

Chemical examination.

(Report on the Building Stones of the United States and Statistics of the Quarry Industry for 1880; Publications of the Tenth Census; Vol. x; Chapter iii, pp. 30–32.)

Gives the application of Thoulet's method for the examination of rocks by means of the heavy Iodide of Potassium and Iodide of Mercury solution to building stones, also the method used for the examination of the group of carbonates.

Plan to illustrate the mineral resources of the United States, and their utilization, at the World's Industrial and Cotton Centennial Exposition of 1884–1885, at New Orleans.

(Proc. U. S. Nat. Mus., vii, 1884, pp. 617–624.)

Also published as Museum Circular No. 31.

HERMAN GEORGE DRESEL.

Notes on some Greenland fishes.

(Proc. U. S. Nat. Mus., vii, Aug. 20, 1884, pp. 244–258.)

[See also under TARLETON HOFFMAN BEAN.]

ROBERT EDWARD EARLL.

Great International Fisheries Exhibition. London, 1883. United States of America. J.—Catalogue of the apparatus for the capture of fish exhibited by the United States National Museum. By R. Edward Earll, curator of the Fisheries Collections, U. S. National Museum, and assistant, U. S. Fish Commission. Washington: Government Printing Office. 1884. 8vo. pp. 1–206 (825–1030).

Great International Fisheries Exhibition. London, 1883. United States of America. L.—Catalogue of the Fish-Cultural Exhibit of the United States Fish Commission. By R. Edward Earll, curator of the Fisheries Collections, U. S. National Museum, and assistant, U. S. Fish Commission. Washington: Government Printing Office. 1884. 8vo. pp. 1–95 (1155–1249).

Hatching blackfish and Spanish mackerel.

(Bull. U. S. Fish. Com., iv, 1884, pp. 415–416.)

GEORGE BROWN GOODE.

Report of the Assistant Director of the United States National Museum for 1882.

(Smithsonian Report, 1882 (1884), pp. 119–263.)

Department of the Interior, U. S. National Museum. Bulletin of the United States National Museum. No. 27. Descriptive catalogues constituting a report upon the exhibit of the fisheries and fish culture of the United States of America, made at the London Fisheries Exhibition, 1883. Prepared under the direction of G. Brown Goode, U. S. Commissioner, and a staff of associates. Washington: Government Printing Office. 1884. 8vo. pp. 1–1279.)S. I. series No. 511.)

Fishery treaties.

(Cyclopædia of Political Economy, iii, 1884, pp. 941–944.)

The aims and limitations of modern fish-culture.

(Science, iii (No. 54, February 15, 1884), p. 208.)

The oyster industry.

(Encyclopædia Britannica, 9th edition, vol. xviii, pp. 107–110.)

The discussion by the American Ornithologists Union of the system of zoological nomenclature.

(Science, iii (No. 56, February 29, 1884), pp. 241–242.)

The exploring voyage of H. M. S. Challenger.

(Science, iii (No. 66, May 9, 1884), p. 576, iv (No. 79, August 8, 1884), p. 116, iv (No. 82, August 29, 1884), p. 176.)

The invention of the vertical camera in photography.

(Science, iii (No. 70, June 6, 1884), p. 672.)

Professor Gill on the assumptions of museum keepers.

(Science, iii (No. 71, June 13, 1884), p. 703.)

On the oyster industry.

(Science, iii (No. 71, June 13, 1884), p. 720.) Abstract.

The oyster industry of the world.

(Bull. U. S. Fish Com., iv, 1884, pp. 468–469; Report American Fish Cultural Association, 1884, pp. 146–148.)

GEORGE BROWN GOODE AND TARLETON H. BEAN.

Notes on some Florida fishes.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 42–47.)

GEORGE BROWN GOODE AND JOHN MATTHEW JONES.

Department of the Interior, U. S. National Museum. Bulletin of the United States National Museum. No. 25. Contributions to the natural history of the Bermudas. Volume 1. Edited by J. Matthew Jones and George Brown Goode. Washington: Government Printing Office. 1884. 8vo. pp. xxiii; 1–353.

S. I. Series No. 495.

ROMYN HITCHCOCK.

Plan of a collection to illustrate the textile industries of the United States to be exhibited at the World's Industrial and Cotton Centennial Exposition of 1884–1885 at New Orleans.

(Proc. U. S. Nat. Mus., vii, 1884, pp. 557–572.)
Also published as Museum Circular No. 24.

WILLIAM TELL HORNADAY.

Common faults in the mounting of quadrupeds.

(Third Annual Report Society of American Taxidermists, 1884, pp. 67–71.)
A critical statement of the most universal, glaring, and reprehensible faults of mammal taxidermists, as shown by their work.

Brief directions for removing and preserving the skins of mammals.

(Proc. U. S. Nat. Mus., vi. 1883 (1884), pp. 485–491. Four illustrations.)
Also published as Museum Circular No. 22.

FREDERIC AUGUSTUS LUCAS.

On the mounting of crustaceans.

(Third Annual Report Society of American Taxidermists, 1884, pp. 74–77.)

On the mounting of turtles.

(Third Annual Report Society of American Taxidermists, 1884, pp. 84–90. Two diagrams.)

JOHN BELKNAP MARCOU.

A review of the progress of North American invertebrate palæontology for 1883.

(American Naturalist, April, 1884, pp. 385–392.)

JOHN BELKNAP MARCOU [JULES MARCOU AND].

United States Geological Survey, J. W. Powell, director. **Mapoteca Geologica Americana.** A catalogue of geological maps of America (North and South), 1752–1881. In geographic and chronologic order. By Jules Marcou and John Belknap Marcou. Washington: Government Printing Office. 1884. 8vo. pp. 1–184.

This work is published as Bulletin No. 7 of the U. S. Geological Survey.

OTIS TUFTON MASON.

—583. An account of the progress in anthropology in the year 1883. By Prof. Otis T. Mason. From the Smithsonian Report for 1883. —Washington: Government Printing Office. 1884. 8vo. pp. 1–43.

Separate: also in Smithsonian Report for 1883.

Fuegian ethnology.

(American Naturalist, xviii, 1884, p. 99.)

The Atlantis.

(American Naturalist, xviii, 1884, p. 99.)

British anthropology.

(American Naturalist, xviii, 1884, p. 216.)

Weather proverbs.

(American Naturalist, xviii, 1884, p. 319.)

The Anthropological Society of Washington.

(American Naturalist, xviii, 1884, p. 321.)

The folk-lore of Shakespeare.

(American Naturalist, xviii, 1884, p. 443.)

The British Anthropometric Committee.

(American Naturalist, xviii, 1884, p. 646.)

Anthropology at the National Capital.

(American Naturalist, xviii, 1884, p. 648.)

The mound-builders.

(American Naturalist, xviii, 1884, p. 745.)

Uniform craniometry.

(American Naturalist, xviii, 1884, p. 839.)

Ethnology of British Guiana.

(American Naturalist, xviii, 1884, p. 840.)

Bureau of Ethnology.

(American Naturalist, xviii, 1884, p. 952.)

Peabody Museum.

(American Naturalist, xviii, 1884, p. 956.)

Anthropology in France.

(American Naturalist, xviii, 1884, p. 1065.)

Physiological inquiries.

(American Naturalist, xviii, 1884, p. 1067.)

The Health Report of Washington.

(American Naturalist, xviii, 1884, p. 1171.)

The Indian Office Report.

(American Naturalist, xviii, 1884, p. 1172.)

GEORGE PERKINS MERRILL.

On Prochlorite from the District of Columbia.

(Proc. U. S. Nat. Mus., vii, June 11, 1884, p. 67.)

Hornblende andesite from the new Bogosloff volcano.

(Science, iv (No. 97, Dec. 12, 1884.), p. 524.)

Notes on the character of the rock formation in the vicinity of Auburn, Maine.

(Report Maine State College, for 1884.)

Read before the Scientific Society of the Maine State College, April, 1884.

The origin of soils.

(Prairie Farmer, Aug. 2, 1884, p. 489.)

Microscopic structure.

(Report on the building stones of the United States, and statistics of the quarry industry, for 1880. Publications of Tenth Census, vol. x; chapter ii, pp. 15–29. 18 plates.)

Preliminary plan for a collection of the building and ornamental stones and rocks of the United States, to be exhibited at the World's Industrial and Cotton Centennial Exposition of 1884–'85, at New Orleans.

(Proc. U. S. Nat. Mus., vii, 1884, pp. 573–574.)

Also published as Museum Circular No. 25.

RICHARD RATHBUN.

Annotated list of the described species of Parasitic Copepoda, (*Siphonostoma*) from American waters, contained in the United States National Museum.

(Proc. U. S. Nat. Mus., vii, Sept. 27, 1884, pp. 483–492.)

Twenty-six species previously described by American and European authorities are recorded from specimens now in the Museum. Nine are recent additions to the fauna of North America. Most of the species were obtained from the New England coast by the U. S. Fish Commission, but several are from other regions, including Alaska. The paper is in the form of a record of specimens, complete data being given with reference to each entry of specimens. But few notes are added.

Notes on the decrease of lobsters.

(Trans. Amer. Fish Cult. Assoc., 1884, pp. 201–208; Bull. U. S. Fish Com., iv, 1884, pp. 421–426; Forest and Stream, xxiii, No. 5, August 28, 1884, p. 89.)

A paper read at the thirteenth annual meeting of the American Fish Cultural Association, held in the U. S. National Museum, Washington, D. C., May 13–15, 1884, and based upon the returns of the Fishery Census of 1880.

The American initiative in methods of deep-sea dredging.

(Science iv (No. 76, July 18, 1884), pp. 54–57.)

A brief historical sketch of deep-sea investigations by Americans, with special reference to improvements made in appliances for deep-sea dredging.

American appliances for deep-sea investigation.

(Science, iv (No. 81, Aug. 22, 1884), pp. 146–151; Science, iv (No. 84, Sept. 12, 1884), pp. 225–229; Science, iv (No. 90, Oct. 24, 1884), pp. 400–404.)

Brief descriptions, with illustrations of the deep-sea appliances for dredging now in use by American explorers, and mainly devised or improved by members of the U. S. Fish Commission and U. S. Coast Survey. The paper is divided into the following subjects: The dredges; trawls and tangles; wire-dredge rope, sieves, &c.

CHARLES RAU.

Extrait des Annales du Musée Guimet. Tome x. La Stèle de Palenqué* du Musée National des États-Unis, à Washington, par le Dr. Charles Rau. Traduit de l'Anglais avec Autorisation de l'Auteur. Lyon Imprimerie Pitrat Aîné, 4, rue Gentil, 4, 1884. Small quarto. pp. 1–103. 5 plates. 14 figures.

Les Statuettes contrefaites du Mont Pisgah. Review.

(Revue d'Ethnographie, iii, No. 1, Paris, 1884, p. 89.)

Circular relative to Contributions of Aboriginal Antiquities to the United States National Museum.

(Proc. U. S. Nat. Mus. vi, 1883 (1884), pp. 479–483.)
Printed in 1883 as Circular 21, U. S. National Museum.

Smithsonian Contributions to Knowledge. 509. Prehistoric Fishing in Europe and North America. By Charles Rau. Washington City: Published by the Smithsonian Institution. 1884. 4to. i–xviii; pp. 342. 406 illustrations.

ROBERT RIDGWAY.

Note on *Zenaidura yucatanensis*, Lawr.

(The Auk, i, Jan., 1884, p. 96.)
Critical remarks on the type specimen in the collection of the U. S. National Museum.

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*This work was also published in Spanish in 1880 under the title "Tablero del Palenque en el Museo Nacional de los Estados-Unidos," as No. 3, vol. iii of the "*Anales del Museo Nacional de Mexico*."

Note on *Phalacrocorax violaceus* and *P. violaceus resplendens.*

(The Auk, i, April, 1884, p. 165.)

Appended to an article by N. S. Goss.

Ortyx virginianus not in Arizona.

(Forest and Stream, xxii (No. 7, March 13, 1884), p. 124.)

In reference to the asserted occurrence of *O. virginianus* near Tucson, Arizona. The species eventually proved, as suggested in the article above cited, to be *O. graysoni*, Lawr.

Southern limit of quail and grouse.

(Forest and Stream, xxii (No. 13, April 24, 1884), p. 243.)

Correcting an error in an article in the preceding number, accrediting the Virginian Partridge, *Ortyx virginianus*, and Ruffed Grouse, *Bonasa umbellus*, to Costa Rica; the species meant being *Ortyx leylandi* and *Dendrortyx macrurus.*

Remarks on two birds usually referred to the genus *Parula*, but which appear to be generically distinct, and for which the generic term *Oreothlypis* is proposed.

(The Auk, i, April, 1884, p. 169.)

Incorporated with Dr. Stejneger's "Analecta Ornithologica," No. iii.

On a collection of Birds from Nicaragua, by Charles C. Nutting, and edited by R. Ridgway.

On some Costa Rican Birds, with descriptions of several supposed new species.

(Proc. U. S. Nat. Mus., vi, 1883, April 11, 1884, pp. 410–415.)

Carpodectes antoniæ, Zeledon (redescribed); *Vireo carmioli*, Baird ?; *Phœnicothraupis carmioli*, Lawr.; *Tachyphonus nitidissimus*, Salv.; *T. luctuosus*, Lafr. and D'Orb.; *Chlorospingus pileatus*, Salv.; *Lanio melanópygius*, Ridgw., sp. nov.; *Empidonax atriceps*, Salv.; *E. viridescens*, Ridgw., sp. nov.; *Pittasoma michleri seledoni*, Ridgw., subsp. nov.; *Acanthidops bairdi*, Zeledon. A new generic name—*Chlorothraupis*, proposed for "*Phœnicothraupis*" *carmioli*, Lawr. In addition to the species mentioned above, a list is given of 18 other species, with localities and dates, and of 5 species obtained from Dr. Van Patten, 4 of which were new to Costa Rica.

Remarks upon the close relationship between the white and scarlet Ibises (*Endocimus albus* and *E. ruber*).

(The Auk, i, July, 1884, pp. 239–240.)

Note on *Astur atricapillus striatulus.*

(The Auk, i, July, 1884, pp. 252–253.)

On the possible specific identity of *Buteo cooperi*, Cass., with *B. harlani*, Aud.

(The Auk, i, July, 1884, pp. 253–254.)

Probable breeding of the Red Crossbill, *Loxia curvirostra americana*, in Central Maryland.

(The Auk, i, July, 1884, p. 292.)

The probable breeding-place of *Passerculus princeps.*

(The Auk, i, July, 1884, p. 292.)

Another Kirtland's Warbler from Michigan.

(The Auk, i, July, 1884, p. 389.)

On a new Carpodectes from Southwestern Costa Rica.

(The Ibis, fifth series, ii (No. 5, Jan., 1884), p. 27. One plate.)

Notes on three Guatemalan birds.

(The Ibis, fifth series, ii (No. 5, Jan., 1884), pp. 43–45.)

Chrysomitris atriceps, Salv., *Ammodromus petenicus*, Salv., and *Spizella pinetorum*, Salv.

Note on *Selasphorus torridus*, Salvin.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, p. 14.)

On *Melanetta fusca* (Linn.) in Alaska.

(Proc. U. S. Nat. Mus., vii, June 11, 1884, p. 68.)

Description of a new Snow Bunting from Alaska.

(Proc. U. S. Nat. Mus., vii, June 11, 1884, pp. 68–70.)

Plectrophenax hyperboreus; McKay's Snow Bunting.

On a collection of birds made by Messrs. J. E. Benedict and W. Nye, of the United States Fish Commission steamer Albatross.

(Proc. U. S. Nat. Mus., vii, July 29, 1884, pp. 172–180.)

New species described are as follows: From the island of Curaçao: (1) *Mimus gilvus rostratus*, (2) *Dendroica rufopileata*, (3) *Icterus curasoënsis*, (4) *Zenaida vinaceo-rufa*. From the island of Old Providence, Caribbean Sea: (5) *Certhiola tricolor*, (6) *Vireosylvia grandior*, (7) *Vireo approximans*, (8) *Elainea cinerascens*.

Description of a new species of Field Sparrow from New Mexico.

(Proc. U. S. Nat. Mus., vii, Aug. 22, 1884, p. 259.)

Spizella wortheni.

Description of a new species of Coot from the West Indies.

(Proc. U. S. Nat. Mus., vii, Sept. 17, 1884, p. 358.)

Fulica caribæa; islands of Guadeloupe and Saint Johns, Lesser Antilles.

Account of exhibit of the Department of Birds in course of preparation for the New Orleans Exposition.

(The Auk, i, Oct., 1884, p. 403.)

A general statement of the condition, extent, &c., of the bird collections of the National Museum.

(The Auk, i, Oct., 1884, pp. 403–404.)

Notes on some Japanese birds related to North American species.

(Proc. U. S. Nat. Mus., vi, 1884, pp. 368–371.)

The bird collection of the National Museum.

(Science, iv (No. 95, Nov. 28, 1884), pp. 496–497.)

A general account of the origin, extent, arrangement, purpose, and condition of the collection.

[*See also under* SPENCER FULLERTON BAIRD.]

Recent outbreaks of the Army-worm.

(Rural New Yorker, 43, Jan. 12, 1884, p. 19.)

Rare occurrence of *Leucania unipuncta* in 1882 and 1883, following its last abundant occurrence in 1881; occurrence of the larvæ at East Windsor, Vt., in June, 1883.

Recent advances in economic entomology.

(Proc. Philos. Soc. Wash., vii, 1884, pp. 10–12.)

Separate, without title-page [Wash., 1884], pp. 10–12. 8vo.

Abstract of communication made to Philosophical Society of Washington, February 2, 1884; characteristics of economic entomology as a science, and difficulties of its prosecution; mention of chief insecticide substances, and discussion of their applicability; notice of recent progress in mechanical appliances.

Tribute to the memory of John Lawrence Leconte.

(Psyche, 4, Nov.—Dec., 1883 [Feb. 11, 1884], pp. 107–110.)

Separate: without title-page [Cambridge, Mass., Feb., 11, 1884], pp. 107–110. 8vo.

Notice. Psyche, *ut cit.*, p. 119.

Biographical notice of J. L. Leconte, b. May 13, 1825, d. Nov., 15, 1883; amount, character, and importance of Leconte's work and writings; his personal character; his relations with G. H. Horn; disposition of his entomological collection.

General truths in applied entomology. Essay.

(Trans. Georgia State Agric. Soc., 1884, pp. 153–159.)

General truths in applied Entomology; being a paper read before the Georgia State Agricultural Society, at Savannah, Ga., February 12, 1884, by Charles V. Riley, Ph. D., United States Entomologist. Extracted from the Transactions of Georgia State Agricultural Society, 1884. With title-page and cover: pp. 153–159. 8vo.

Importance of insects and of the study of economic entomology; causes of the destructive prevalence and amount of the ravages of insects in North America; complicated nature of the problem which the economic entomologist has to solve; mention of the principal insecticide substances in use now and formerly; special availability of several of these substances for certain purposes; transcendent importance of arsenical substances (arsenic, Paris green and London purple), petroleum and pyrethrum for insecticide purposes; methods of preparation and use of these latter substances; specific action of pyrethrum powder, its effect on higher animals, and probable use in medicine and as a disinfectant; petroleum emulsions against *Phylloxera vastatrix;* mechanical devices for spraying liquid insecticides.

The Army-worm, *Leucania unipuncta*, Haw.

(3d Rep. U. S. Entom. Com., 1883 [March 1884], pp. 89–156, pl. 1–2; expl. of pl. on p. 2 of expl. of pl.)

The Army-worm; being an account of its history and injuries in the United States up to the year 1883, with practical recommendations. Author's edition.

(Extracted from the Third Report of the United States Entomological Commission, 1883. Washington, March, 1884, pp. 89–156, pl. 1–2. 8vo.)

The army Worm, *Leucania unipuncta* Haw. Advance reprint.

(Rep. [U. S.] Commiss. Agric. for 1881 and 1882 [Jan., 1883.])

(Riley, C. V., Rep. of the Entomologist [Dec.], 1882, p. 89–106 [29–46.])

Chapter 6 of 3d Report of U. S. Entomological Commission. Various significances of the term "army-worm;" synonomy, geographical distribution, ravages, seasons, food-plants, enemies and parasites of and means against *Leucania unipuncta* ; past history of this insect in detail; detailed descriptions of eggs, larvæ (at all stages), pupa, and imago; sexual differences in imagos; figures of egg, larva, pupa, and imago, and of several parasites and enemies; detailed accounts of habits; periods, prolificacy, oviposition, hibernation, and number of broods yearly; causes of sudden appearance and disappearance; bibliography of the literature concerning *Leucania unipuncta*.

Canker-worms.

(3d Rep. U. S. Entom. Com., 1883 [March, 1884], pp. 157-197, pl. 3; expl. of pl. on p. 2 of expl. of pl.)

Canker worms; being an account of the two species injurious to fruit and shade trees, with practical suggestions. Author's edition.

(Extracted from the Third Report of the United States Entomological Commission, 1883." [Washington, 1884], pp. 157-198, pl. 3. 8vo.)

Chapter 7 of 3d Report of U. S. Entomological Commission. Systematic position and general characteristics of *Paleacrita vernata* and *Anisopteryx pometaria* ; nomenclature and synonomy, past history, geographical distribution, seasons, habits, food-plants, enemies, parasites and ravages of and means against these two species, with detailed tabular and comparative descriptions, and with figures of eggs, larvæ, pupæ, imagos, and details for their discrimination.

Oviposition of the Round-headed Apple-tree borer.

(Rural New Yorker, 43, March 1, 1884, p. 132, 1 fig. 73.)

Notice of C. G. Atkins' "Eggs of Round-headed Apple-tree borer" (op. cit., January 12, 1884, p. 19), confirming Atkins' account of the method of oviposition of *Saperda bivittata*, and describing this method, referring to and quoting from author's "New facts about the round-headed apple-tree borer" (N. Y. Weekly Tribune, February 20, 1878), in which the explanation of this method was first published, and correcting several statements in Wm. Saunders' "Insects injurious to fruits, * * * 1883," in regard to the oviposition of different insects; description and figure of egg of *S. bivittata;* figures of the burrows and hole of exit of this beetle, and figures of the pupa and of the position of the egg when deposited.

The Chinch-bug. (Another entomologist expresses his views regarding the farmers' pest.)

(Watertown (N. Y.) Daily Times, March 27, 1884.)

Notice of articles by J. A. Lintner on the occurrence of *Blissus leucopterus* in New York State, in unusual abundance, in 1882 and 1883; this occurrence not regarded as warrant for great alarm; recommendations of means against this insect.

A root-infesting insect.

(Rural New Yorker, 43, April 5, 1884, p. 221.)

Inquiry from H. P., of Archer, Fla., with answer; roots of several plants injured by nematodes of the genus *Anguillula ;* incomplete life-history of and suggestion of means against these worms.

Notes on North American Psyllidæ.

(Proc. Biol. Soc. Wash., ii, 1882–1884, pp. 67–79.)

Printed as separate, with same title. Washington, April 10, 1884.

Notice of earlier studies of European and North American *Psyllidæ;* list of the 18 nominal species of *Psyllidæ* hitherto described from North America; systematic and synonymical list of the same; descriptions of *Pachypsylla*, n. g. (*psyllinæ*) and of its three known species—*P. venusta*, *P. celtidis-mamma*, and *P.* (*Blastophysa* [new subgenus]) *celtidis-gemma*, n. sp.; dichotomic table of these three species of *Pachypsylla;* descriptions of *Ceropsylla*, n. g. (*triozinæ*), *C. sideroxyli*, n. sp., *Rhinopsylla*, n. g. (*triozinæ*), and *Rh. schwarzii*, n. sp.

The Silk Industry in the United States.

(Science, iii [No. 57, March 7, 1884], pp. 290–292.)

Review of Wm. C. Wyckoff's "Silk manufacture in the United States" [not seen]; early history and present status of silk-culture in North America; criticism of Wyckoff's estimates of the amount of silk raised in early times; respective relations of silk-culture and silk manufacture to questions of free trade and protection in the United States.

Remarks on the Bag-worm: *Thryidopteryx ephemeræformis.*

(To be published in Proc. Biol. Soc. Wash., 2, 1882–1884 (April, 1884), pp. 80–83, figs. 1–3.)

Printed as separate. Washington, April 10, 1884.

Explanation of the more important and less known facts in relation to the life-history of *Thryidopteryx ephemeræformis*, especially in reference to the act of coition and the occurrence of parthenogenesis; figures of the insect in all stages and of the external male genitalia.

Introduction. (U. S. Department of Agriculture, Division of Entomology.) Reports of observations. [Bulletin, No. 4.] Washington, May 3, 1884, pp. 7–8.

Notices of the several reports of agents of the Division of Entomology of the U. S. Department of Agriculture, published in Bulletin No. 4 of that division.

Acronycta betulæ, n. sp.

(Bull. Brooklyn Entom. Soc., 7, May, 1884, pp. 2–3, fig. —.)

Describes *Acronycta betulæ*, n. sp., reared from *Betula nigra;* seasons and habits of larva; comparison with related species.

Quelques mots sur les insecticides aux États-Unis, et proposition d'un nouveau remède contre le Phylloxera.

(Communication faite à la Société d'Agriculture de l'Hérault à la séance du 30 juin 1884. Montpellier, 1884. pp. 1–8. 8vo.)

Address made at meeting of Société d'Agriculture de l'Hérault, at Montpellier, France, June 30, 1884. Resistant vines better than the best insecticides as a means against *Phylloxera vastatrix;* mention of principal insecticides in use in America, especially arsenical substances, petroleum, and pyrethrum, the modern improved use of which the author introduced; method of action and mode of application of these insecticides, especially application by the cyclone nozzle, and the subterranean application of kerosene emulsion as a means against *Ph. vastatrix;* believes tobacco vapor, under favorable conditions, would kill this insect.

"Riley à Montpellier,"

With editorial introduction, discussion, and an account of a banquet in honor of Mr. Riley, which followed.

(Messager du Midi, tome v, July 10, 1884, pp. 255–265.)

The *Psyllidæ* of the United States.

(Proc. Amer. Assoc. Advanc. Sci., xxxii (1883), 1884 Riley, C. V. The psyllidæ of the United States [Salem, Mass.], July, 1884, p. 319.)

Abstract of communication made to American Association for the Advancement of Science at its Minneapolis meeting, August, 1883; characteristic and economic importance of *Psyllidæ;* status of the present knowledge of this family in United States; list of the new genera and species described in the communication, with statement of the food-plants of these species; characteristics of the eggs and young of *Psyllidæ*.

Some recent discoveries in reference to *Phylloxera*.

(Proc. Amer. Assoc. Advanc. Sci., xxxii, 1883 (1884). (Riley, C. V. The *Psyllidæ* of the United States [Salem, Mass.], July, 1884), p. 320.)

Abstract of communication made to American Association for the Advancement of Science, at its Minneapolis meeting, August, 1883; interest attaching to a knowledge of the life history of insects of the genus *Phylloxera;* imperfectness of this knowledge; degree to which it has attained; character of gall and location of impregnated egg of *Ph. spinosa*.

Improved method of spraying trees for protection against insects.

(Proc. Amer. Assoc. Advanc. Sci., xxxii, 1883 (1884), pp. 466–467.)

Abstract of communication made to American Association for the Advancement of Science at its Minneapolis meeting, August, 1883; brief description of apparatus, especially of "cyclone nozzle" and adjustable hose, devised for spraying trees with various insecticides; mention of insecticide substances used.

The *Psyllidæ* of the United States.

(Proc. Amer. Assoc. Advanc. Sci., xxxii, August, 1883; Minneapolis meeting (July 1884), pp. 319–320, 466–467. 8vo.)

Separate of papers published by author in Proceedings of American Association for the Advancement of Science, xxxii, 1883 (1884), with following titles: The *Psyllidæ* of the United States, p. 319.—Some recent discoveries in reference to *Phylloxera*, p. 320.—Improved method of spraying trees for protection against insects, pp. 466–467.

A new insect injurious to wheat.

(Bull. Brooklyn Entom. Soc., vii, December, 1884, pp. 111–112.)

Separate [Brooklyn, N. Y., December, 1884], p. 111. 8vo.

Describes larva, pupa, and female imago of *Isosoma grande* ["grandis Err."] n. sp., reared from wheat stems in Indiana.

Report by C. V. Riley.

(Proc. U. S. Nat. Mus., vi, July 27, 1883 (1884), pp. 104–105.)

Review of F. Humbert's "*Lucilia macellaria* infesting man" (op. cit., pp. 103–104); identification of the insect mentioned in that article, with reference to other mentions of it, and remarks on its geographical distribution and means against it.

Insects in relation to agriculture.

(Encyclopædia Britannica, Amer. ed., 1884 [not seen], pp. 135–142, figs. 1–29.)

Chapter 9 of article "Agriculture." Brief accounts, with numerous illustrations, of the insects named below, and of means against them, with cross-references to accounts of other insects in other portions of the work. The headings and subjects of the sub-chapters are as follows: IMPORTANCE OF ECONOMIC ENTOMOLOGY, p. 135.—INSECTS INJURIOUS TO FRUIT AND FRUIT-TREES.—Apple curculio (The), *Anthonomus quadrigibbus*, Say, p. 135, fig. 1.—Apple-maggot (The), or "railroad-worm," *Trypeta pomonella*, Walsh., p. 135.—White-marked tussock-moth (The), *Orgyia leucostigma*, Sm. and Abb., pp. 135–136, fig. 2.—Apple-tree tent-caterpillar (The), *Clisiocampa americana*, Harr., p. 136, figs. 3–4.—Fall webb-worm (The), *Hyphantria textor*, Harr., p. 136, fig. 5.—Oyster-shell bark-louse of the Apple (The), *Mytilaspis promicorticis*, Riley, pp. 136–137, fig. 6.—Round-headed Apple-tree borer (The), *Saperda binittata*, Say, p. 137, fig. 7.—Flat-headed Apple-tree borer (The), *Chrysobothris femorata*, Fabr., p. 137.—Spring Canker-worm (The), *Paleacrita vernata*, Peck, p. 137, figs. 8–9.—Fall Canker-worm (The), *Anisopteryx pometaria*, Harris, p. 137, figs. 10–11.—Peach-tree borer (The), *Ægeria exitiosa*, Say, pp. 137–138, fig. 12.—Currant-stalk borer (The), *Ægeria tipuliformis*, L., p. 138.—Imported currant-worm (The), *Nematus ventricosus*, Klug., p. 138, figs. 13–14.—Native currant-worm (The), *Pristiphora grossulariæ*, Walsh, p. 138.—Snowy tree-cricket (The), *Œcanthus nivens*, Harr., p. 138, figs. 15–16.—INSECTS INJURIOUS TO CEREALS AND FORAGE CROPS.—White grub (The), *Lachnosterna fusca*, Froh., pp. 138–139, fig. 17.—Clover-seed midge (The), *Cecidomyia leguminicola*, Lintner, p. 139.—Joint-worm (The), *Isosoma hordei*, Harr., p. 139, fig. 18.—Wheat-midge (The), *Diplosis tritici*, Kirby, p. 139.—Cut-worms, family *Noctuidæ*, genera *Agrotis*, *Mamestra*, *Hadena*, and *Prodenia*, p. 139.—Wire worms, family *Elateridæ*, p. 139.—INSECTS INJURIOUS TO GARDEN VEGETABLES.—Imported cabbage-worm (The), *Pieris rapæ*, Schrank, p. 139, figs. 19–20.—Southern cabbage butterfly (The), *Pieris protadice*, Boisd, p. 140.—Potherb butterfly (The), *Pieris oleracea*, Boisd, p. 140.—Cabbage plusia (The), *Plusia brassicæ*, Riley, p. 140, fig. 21.—Harlequin cabbage-bug (The), *Murgantia histrionica*, Hahn., p. 140, fig. 22.—Pea-weevil (The), *Bruchus pisi*, Linn., p. 140, fig. 23.—Bean-weevil (The), *Bruchus fabæ*, Riley, p. 140, fig. 24.—Blister-beetles, meloid genera, *Macrobasis*, *Epicauta*, &c., p. 140, fig. 25.—Striped cucumber-beetle (The), *Diabrotica vittata*, Fabr., pp. 140–141, figs. 26–27.—INSECTS INJURING MISCELLANEOUS FIELD-CROPS.—Cotton-boll worm (The), or corn-ear worm, *Heliothis armigera*, Hubn., p. 141, fig. 28.—Tobacco-worm (The), *Sphinx carolina*, L., p. 141.—INSECTS INJURIOUS TO THE VINE.—INSECTS INJURIOUS TO LIVE-STOCK.—Bot-fly of Cattle (The), *Hypoderma bovis*, Latr., p. 141.—Sheep bot-fly (The), *Œstrus ovis*, Linn., p. 141, fig. 29.—Horse bot-fly (The), *Gastrophilus equi*, Fabr., pp. 141–142.—[LIST OF PRINCIPAL AMERICAN WRITERS AND WRITINGS UPON INSECTS IN RELATION TO AGRICULTURE], p. 142. [The above sub-chapters are not separately recorded.]

The articles to which cross-references are made are the following: Army worm, chinch-bug, coddling-moth, Colorado potato-beetle, cotton-worm, Hessian fly, locust, phylloxera, plum curculio.

Army-worm, *Leucania unipuncta*, Harr.

(Encyclopædia Brittanica, Amer. ed., 1884 [not seen], pp. 317–318, 2 figs.)

Geographical distribution, seasons, habits, and food-plants of and means against *Leucania unipuncta;* references to the more important articles on this insect; figure of larva and imago.

Orthoptera.

(Standard Natural History (The), ii, 1884, pp. 167-203, figs. 243-285, 1 pl.) Systematic position and limitations, classificational characters, transformations, molts, and geographical and geological distribution of the order *Orthoptera;* characters, habits, and distribution of the several families; mention of the principal North American and of some foreign species, with more particular accounts of many species, especially in regard to their stridulation, oviposition, and previously unrecorded life-history facts, with figures of a few species and of their eggs. The species mentioned most at length are: *Ectobia germanica*, *Phasmomantis carolina*, *Diapheromera femorata*, *Œcanthus niveus*, *O. latipennis*, *Orocharis saltator*, *Comptonotus scudderi*, *Cyrtophyllus concavus*, *Microcentum retinerve*, and *Caloptenus spretus*.

JOHN ADAM RYDER.

On apparatus for collecting oyster spat.

(Bull. U. S. Fish Com., iv, 1884, p. 373.)

On the forces which determine the survival of fish embryos.

(Transactions of the American Fish Cultural Association, 1884. (Thirteenth annual meeting), pp. 195-199. (Forest & Stream, Aug. 14, 1884, pp. 50-51.)

Journal of operations on the grounds of the Eastern Shore Oyster Company on Chincoteague Bay, near Stockton, Md., during the summer of 1883.

(Bull. U. S. Fish Com., iv, 1884, pp. 43-47.)

Carp do eat young fishes.

(Bull. U. S. Fish Com., iv, 1884, p. 152.)

Report respecting the present condition and future prospects at Saint Jerome's Creek for the work of oyster-culture.

(Bull. U. S. Fish Com., iv, 1884, pp. 235-237.)

Floats for the so-called fattening of oysters.

(Bull. U. S. Fish Com., iv, 1884, pp. 302-303.)

Note on the regeneration of the scales of the German carp.

(Bull. U. S. Fish Com., iv, 1884, pp. 345-346.)

On the cause of the greening of oysters.

(Reports: U. S. Fish Com., 1882 (1884), pp. 793-801.)
A translation of "Notice sur la cause du verdissement des huîtres," par M. Puységur, in Rev. Maritime et Coloniale, pp. 11, 1 pl. Paris, Berger-Levrault et Cie., 1880.

On accounts of experiments in oyster-culture and observations relating thereto. (Second series.)

(Report: U. S. Fish Com., 1882 (1884), pp. 763-778.)

On a new form of filter or diaphragm to be used in the culture of oysters in ponds.

(Bull. U. S. Fish Com., iv, 1884, pp. 17-31.)

A contribution to the embryography of osseous fishes.

(Report: U. S. Fish Com., 1882 (1884), pp. 455–605. Plates I–XII. 11 figures.)

On the preservation of embryonic materials and small organisms, together with hints upon embedding and mounting sections serially.

(Report: U. S. Fish Com., 1882 (1884), pp. 607–629.)

Supplementary note on the coloration of the blood corpuscles of the oyster.

(Report: U. S. Fish Com., 1882 (1884), pp. 801–805.)

On the development of *Mola*.

(Science, iv, No. 93, Nov. 14, 1884).
Also in Bulletin of Science, iv.

The side organs of Gastrostomus.

(American Naturalist, xviii (No. 5, May, 1884), p. 547.)
Abstract.

On a skin-parasite of the Cunner, *Ctenolabrus adspersus*.

(Bull. U. S. Fish Com., iv, 1884, pp. 37–42.)

On the literature and systematic relations of the Saccopharyngoid fishes.

[See under Theodore Gill, p. 373.]

Morphology and evolution of the tail of osseous fishes.

(Science, iv (No. 87, Oct. 3, 1884), pp. 341–342.)
Abstract of paper read before the American Association for the Advancement of Science in Philadelphia, September, 1884.

The pedunculated lateral-line organs of *Gastrostomus*.

(Amer. Naturalist, xviii, 1884, p. 547. Science, iii (Mo. 48, Jan. 4, 1884), p. 5.)

A sketch of the life history of the oyster.

(Appendix II of "A Review of the Fossil Ostreidæ of North America," in Fourth Annual Report of the Director U. S. Geological Survey, 1882–1883 (1884), pp. 317–333, plates lxxiii–lxxxii.

On some points in microtomy.

(The Amer. Monthly Microscop. Jour., v (No. 10, Oct., 1884), pp. 190–191).

On the chlorophylloid granules of Vorticella.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 9–12, 1 figure.
Critique.

[See under Theodore Nicholas Gill and John Adam Ryder.]

ROBERT EDWARDS CARTER STEARNS.

Transportation of clams and oysters.

(Bull. U. S. Fish Com., iv, 1884, pp. 219–220.)

LEONHARD STEJNEGER.

Dendrocopus purus, a new species of woodpecker from Kamtschatka.

(The Auk, i, Jan., 1884, pp. 35-36.)
Type in National Museum collection.

On changes in ornithological nomenclature.

A reply to critics.
(The Auk, i, April, 1884, pp. 114-120.)
Based on researches prosecuted at the U. S. National Museum.

Notes on the genus *Acanthis*.

(The Auk, i, April, 1884, pp. 145-156.)
Based on material contained in the collection of the National Museum.

Contributions to the history of the Commander Islands, No. 2. Investigations relating to the date of the extermination of Steller's sea-cow.

(Proc. U. S. Nat. Mus., vii, July 29, 1884, pp. 181-189.)

Analecta Ornithologica. I. The occurrence of *Turdus aliciæ* in the Palæarctic region. II. On the earliest available name of the American Titlark. III. A brief review of the synonymy of the genus *Compsothlypis* (= *Parula*). IV. On the earliest available name of the Cardinal Grosbeak. V. More "Ornithophilologicalities."

(The Auk, i, April, 1884, pp. 166-173.)
A series of most important articles based wholly upon material in, and researches prosecuted at, the National Museum.

Analecta Ornithologica. (Second series.) VI. On the Ptarmigans of Nelson's "Birds of Bering Sea," &c., especially those belonging to the group *Attagen*, Kaup. VII. On some changes necessary in North American and European Ornithological Nomenclature, if generic appellations previously applied in botany be not rejected. VIII. *Larus schistisagus*, a new species of gull from the North Pacific. IX. *Priocella tenuirostris* (Aud.) not a bird of Bering Sea or the Arctic Ocean. X. On old and new generic names.

(The Auk, i, July, 1884, pp. 225-236.)

Analecta ornithologica. (Third series). XI. Notes on Arctic *Lari*. XII. *Chrysomitris* or *Spinus?* XIII. On the systematic name of the American Hawk Owl. XIV. On *Sterna nilotica* of Hasselquist. XV. *Habia* against *Zamelodia*. XVI. On the oldest available name for Wilson's Phalarope.

(The Auk, i, July, 1884, pp. 358-367.)

A new subspecies of willow grouse, from Newfoundland.

(The Auk, i, July, 1884, p. 368.)

On the use of trinomials in American Ornithology.

(Proc. U. S. Nat. Mus., vii, June 11, 1884, pp. 70-81.)

Remarks on the species of the genus *Cepphus*.

(Proc. U. S. Nat. Mus., vii, August 5, 1884, pp. 210-229. Six figures.)
A very important monographic essay.

A brief review of the Lagopodes belonging to the group *Attagen*, Kaup.

(Zeitschrift für die gesammte Ornithologie (Budapest, Hungary) 1, Jahrgang, 1884, pp. 86–92. Plate V.

Based exclusively on specimens in the National Museum collection.

On the shedding of the claws in the Ptarmigans and allied birds.

(American Naturalist, August, 1884, pp. 774–776.)

FREDERICK WILLIAM TRUE.

Great International Fisheries Exhibition. London, 1883. United States of America. H. Catalogue of the Aquatic Mammals exhibited by the United States National Museum. By Frederick W. True, curator of the Department of Mammals, United States National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 1–22.

A muskrat with a round tail.

(Science, iv (No. 75, July 11, 1884), p. 34.)

On a new muskrat, *Neofiber alleni*, from Florida.

(Proc. U. S. Nat. Mus., vii, July 29, 1884, pp. 170–172.)

Description of a new species and genus, intermediate between *Fiber* and the Arvicolas.

Barbirussa tusks from an Indian grave in British Columbia.

(Science, iv (No. 75, July 11, 1884), p. 34.)

Photographs of the interior of a coal mine.

(Science, iv (No. 84, Sept. 12, 1884), pp. 223–224.)

Note upon some photographs taken by the Metallurgical Department for exhibition at the New Orleans Exposition.

Suggestions to the keepers of the U. S. life-saving stations, lighthouses, and light-ships; and to other observers, relative to the best means of collecting and preserving specimens of whales and porpoises.

(Extracted from the Annual Report of the Commissioner of Fish and Fisheries for 1883 (1884), and printed as a separate). 8vo. pp. 1–26. Plates i–xi.

Contains, in addition to detailed instructions for collecting cetaceans, a list of, an artificial key to, and figures of, all the genera.

Provisional plan for a collection of mammals to be exhibited at the World's Industrial and Cotton Centennial Exposition of 1884–'85, at New Orleans.

A provisional list of the mammals of North and Central America, and the West Indian Islands.

(Proc. U. S. Nat. Mus., vii, 1884, pp. 585–611.)

This paper was also published as Circular 29, U. S. National Museum.

Contains an enumeration of all the species and varieties of mammals found north of the Isthmus of Panama, both terrestrial and aquatic.

Bot-flies in a turtle.

(Science, iv (No. 96, Dec. 5, 1884), p. 511.)

Porpoise-fishing at Cape May, New Jersey.

(Bull. U. S. Fish Com., iv, 1884, pp. 431–432.)

On the skeleton of *Phoca* (*Histriophoca*) *fasciata*, Zimmerman.

(Proc. U. S. Nat. Mus., vi, 1883, pp. 417–426, April 11, 1884. Plates xi–xiv.)

Gives a description of the entire skeleton of the Ribbon Seal, based upon a specimen obtained in Alaska in 1880, by Mr. Wm. H. Dall. *Histriophoca* is regarded as a subgenus in the genus *Phoca*, between *Pusa* and *Pagophilus*.

The Lorillard-Charnay collection.

(The Century, Feb., 1884.)

Notes upon the collection of casts of Toltec inscriptions and sculpture recently received by the Museum.

CHARLES DOOLITTLE WALCOTT.

Appendages of the Trilobite.

(Science, iii (No. 57, March 7, 1884), pp. 279–281, 3 figures.)

Notes on the original specimen described by Prof. Mickleborough (Cin. Jour. Nat. Hist., vi, 1883, p. 200).

Notes on Paleozoic rocks of Central Texas.

(Amer. Jour. Sci., xxviii, Dec., 1884, pp. 431–433.)

Notes on the discovery of the Grand Cañon of the Colorado, Arizona, in Central Texas, and the mode of occurrence of the Potsdam formation and fauna, and the granite of Burnet and Llano counties.

United States Geological Survey. J. W. Powell, director. On the Cambrian faunas of North America. Preliminary studies, by Charles Doolittle Walcott. Washington: Government Printing Office. 1884. 8vo. pp. 1–74. Plates i–x.

This is a review of the fauna of the St. John formation contained in the Hartt collection at Cornell University, also of the fauna of the Braintree argillities, and a description of a new genus and species of Phyllopoda, from the Middle Cambrian of Vermont. A duplicate series of the St. John species will be given to the National Museum.

United States Geological Survey. J. W. Powell, director. Paleontology of the Eureka district. By Charles Doolittle Walcott. Washington: Government Printing Office, 1884. 4to. pp. i–xiii, 1–298, Plates i–xxiv.

This work forms volume viii of the series of monographs published by the U. S. Geological Survey.

Deer Creek coal field, White Mountain Indian reservation, Arizona.

(Report and Appendix U. S. Senate Ex. Doc., No. 20, 48th Congress, 2d session, pp. 2–7, Nov. 28, 1884.)

LESTER FRANK WARD.

On Mesozoic Dicotyledons.

(Amer. Journ. Sci., 3d series, vol. xxvii, April, 1884, pp. 292–303; Annals and Magazine of Nat. Hist. (London), 5th series, vol. xiii, May, 1884, pp. 383–396.)

An historical review, with numerous bibliographical citations, of the discovery of dicotyledonous plants in the Cretaceous formation, and an attempt to correlate the various horizons and localities where found; also an enumeration of the species from each horizon. Concluding reflections upon the probable Jurassic origin of the subclass Dicotyledons.

List of plants added to the Flora of Washington and vicinity, from April 1, 1882, to April 1, 1884.

(To be published in Proc. Biol. Soc. of Wash., vol. ii.)

Printed as a separate, April 10, 1884.

This is a continuation of the general catalogue as published in Bulletin No. 22, U. S. National Museum (guide to the Flora of Washington and vicinity), and conforms in arrangement, type, &c., as nearly as possible, with that publication.

Caulinites and Zamiostrobus.

(Science, iii (No. 65, May 2, 1884), pp. 532–533.)

Reply to a letter by Mr. Joseph F. James, in a previous number of Science, criticising Mr. Lesquereux's figures of these fossil plants in his "Tertiary Flora."

The claims of political science.

(Science, iii (No. 72, June 20, 1884), p. 748.)

A brief note contrasting the treatment of political phenomena by scientific men with that of other departments of natural phenomena, and maintaining their essential homogeneity.

The Upper Missouri River system. (Illustrated.)

(Popular Science Monthly, xxv (No. 149, Sept., 1884), pp. 594–605.)

A description of the process by which the Upper Missouri and Yellowstone Rivers excavate and transform their valleys, based upon personal observations chiefly made while descending the Missouri in an open boat, from Fort Benton to Bismarck, in August and September, 1883.

Irrigation in the Upper Missouri and Yellowstone Valleys.

(Science, iv (No. 82, Aug. 29, 1884), pp. 166–168.)

In this article the practicability and importance of irrigating the valleys of these rivers is pointed out, and the advantage of making it a national enterprise to be conducted by the Government is considered.

Sweet Cicely as a bur.

(Bull. of the Torrey Botanical Club, New York, xi, August, 1884, pp. 92–93.)

A note pointing out that seeds of *Osmorrhiza longistylis* are adapted to being distributed by animals in the manner of burs.

Mind as a social factor.

(Mind (London), ix, October, 1884, pp. 563–573.)

This paper was read before the Anthropological Society of Washington, February 19, 1884, as the vice-presidential address for the Sociological Section. It was also read before the Metaphysical Club of Johns Hopkins University, April 22, 1884. It is an attempt to show that psychic phenomena, as produced by beings with a highly-developed brain, have constituted a class so far superior to all other forms of activity, that they must be treated by the sociologist as distinct and not regarded as identical with the physical forces of inanimate nature, as is practically done in the current *laissez faire* philosophy.

The fossil flora of the globe.

(Botanical Gazette, iv, October and November, 1884, pp. 169–174.)

An abstract of three papers on this subject read September 8, 1884, before the Biological Section of the American Association for the Advancement of Science at Philadelphia. The subject is treated from the historical, geological, and botanical standpoints, and a tabular exhibit of the numerical status of vegetable paleontology is appended.

CHARLES ABIATHAR WHITE.

Description of certain aberrant forms of the chamidæ from the Cretaceous rocks of Texas.

(Bull. U. S. Geol. Survey, No. 4, 1884, pp. 5 (93)-9 (97). Plates i-v.)
Based on material in the National Museum.

On a small collection of Mesozoic fossils obtained in Alaska by Mr. W. H. Dall, of the U. S. Coast Survey.

(Bull. U. S. Geol. Survey, No. 4, 1884, pp. 10 (98)-15 (103). Plate vi.)
Based on material in National Museum.

On the nautiloid genus, *Enclimatoceras*, Hyatt, and a description of the type-species.

(Bull. U. S. Geol. Survey, No. 4, 1884, pp. 16 (104)-17 (105). Plates vii-ix.)
Based on Museum material.

Fossils of the Indiana rocks, No. 3.

(Thirteenth Annual Report of the State Geologist of Indiana, pp. 107-180. Plates 23-29.)
Based in part on Museum material.

The enemies and parasites of the oyster, past and present.

(Science, iii (No. 68, May 23, 1884), p. 618.)

On the adaptability of the prairies for artificial forestry.

(Science, iii (No. 62, April 11, 1884), pp. 438-443.)

Glacial drift in Montana and Dakota.

(American Journal of Science, 3d series, xxvii (No. 158, Feb., 1884), pp. 112-113.)

On the character and function of the epiglottis in the bull-snake (Pityophis).

(American Naturalist, xviii (No. 1, Jan., 1884), pp. 19-21. Two wood-cuts.)
Based in part on Museum material.

The permanence of the domestic instinct in the cat.

(American Naturalist, xviii (No. 2. Feb., 1884), pp. 213-214.)

Certain phases in the geological history of the North American Continent, biologically considered.

Published in pamphlet form and intended for vol. ii, Proceedings of the Washington Biological Society.

HENRY CRÉCY YARROW,

Case of poisoning from the bite of a copperhead (*Ancistrodon contortrix*, Linn.).

(Trans. American Journal of the Medical Sciences, Philadelphia, 1884, n. s., clxxiv, pp. 423-435.)

PART III.—PAPERS BY INVESTIGATORS NOT OFFICERS OF THE MUSEUM, BASED ON MUSEUM MATERIAL.

THOMAS MAYO BREWER,

Boston, Massachusetts.

[See under SPENCER FULLERTON BAIRD.]

THOMAS MAREAN CHATARD,

Chemist, U. S. Geological Survey.

[See under FRANK WIGGLESWORTH CLARKE.]

ELLIOTT COUES,

Professor of Anatomy, Medical Department, Columbian University, Washington.

Key to North American birds, containing a concise account of every species of living and fossil bird at present known from the continent north of the Mexican and United States boundary, inclusive of Greenland. Second edition, revised to date, and entirely rewritten; with which are incorporated General Ornithology; an outline of the structure and classification of birds; and Field Ornithology; a manual of collecting, preparing, and preserving birds. By Elliott Coues, M. A., M. D., Ph. D., member of the National Academy of Sciences, &c. Profusely illustrated. Boston: Estes and Lauriat. 1884. Imp. 8vo. pp. i–x; 1–863.

HENRY WOOD ELLIOTT.

The monk-seal of the West Indies, *Monachus tropicalis*, Gray.

(Science, iii (June 20, 1884), pp. 752–753.)

Contains a figure of the specimen obtained for the Museum by Professor Poey, in Cuba, and notes upon the history of the species.

The destruction of carp by the musk-rat (*Fiber zibethicus*). Methods of trapping the rodent.

(Bull. U. S. Fish Com., iv (1884), pp. 296–297.)

WALTER FAXON,

Assistant Professor of Zoology, Harvard University, Cambridge, Mass.

Contributions from the Zoological Laboratory of the Museum of Comparative Zoology at Harvard College. No. VII. Descriptions of new species of *Cambarus*; to which is added a synonymical list of the known species of *Cambarus* and *Astacus*.

(Proc. Amer. Acad. Arts and Sciences, xx, 1884, pp. 107–158.)

Describes the following new species from the collection of U. S. National Museum:

	Page.
Cambarus pubescens, Faxon	109
Cambarus simulans, "	112
Cambarus argillicola, "	115

		Page.
Cambarus Girardianus, Faxon		117
Cambarus Palmeri,	"	124
Cambarus alabamensis,	"	125
Cambarus compressus,	"	127
Cambarus forceps,	"	133
Cambarus Shufeldtii,	"	134

Twelve additional species are also described from other sources. The synonymical list contains the names of 69 species, of which 56 species (51 of *Cambarus* and 5 of *Astacus*) are found within the limits of the United States.

CHARLES H. FERNALD,

Professor of Natural History, State College, Orono, Me.

Directions for collecting, preserving, and transporting tortricids and other small moths.

(Proc. U. S. Nat. Mus., vii, 1884, pp. 577-579.)
Also published as Museum circular, No. 27.

SAMUEL GARMAN,

Museum of Comparative Zoology, Cambridge, Mass.

The reptiles of Bermuda. By Samuel Garman, Museum of Comparative Zoology, Cambridge, Mass. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 285-303.

CHARLES H. GILBERT,

Instructor in Zoology, Indiana University.

A list of fishes collected in the east fork of White River, Indiana, with descriptions of two new species.

(Proc. U. S. Nat. Mus., vii, Aug. 5, 1884, pp. 199-205.)

Notes on the fishes of Switz City Swamp, Green County, Indiana.

(Proc. U. S. Nat. Mus., vii, Aug. 5, 1884, pp. 206-210.
[See under DAVID STARR JORDAN and CHARLES H. GILBERT.]

THEODORE NICHOLAS GILL,

Professor of Zoology, Columbian University.

Synopsis of the genera of the super-family *Teuthidoidea* (families *Teuthididæ* and *Siganidæ*).

(Proc. U. S. Nat. Mus., vii, Aug. 28, 1884, pp. 275-281.)

[Review of the Progress] of Zoology.

(Smithsonian Report, pp. 565-632, for 1882 (1884).

Synopsis of the Plectognath fishes.

(Proc. U. S. Nat. Mus., vii, Sept. 18, 1884, pp. 411-427.)

Note on the Sternoptychidæ.

(Proc. U. S. Nat. Mus., vii, Sept. 4, 1884, pp. 349-351.)

The osteological characteristics of the Lutjaninæ.

(Proc. U. S. Nat. Mus., vii, Sept. 4, 1884, pp. 351–355.)

A contribution to the terminology of ichthyography.

(Proc. U. S. Nat. Mus., vii, Sept. 17, 1884, pp. 356–357.)

What are the Eurypharyngidæ?

(Nature, xxix, p. 236, Jan. 10, 1884.)

THEODORE NICHOLAS GILL AND JOHN ADAM RYDER.

Note on *Eurypharynx* and an allied new genus.

(Zoologischer Anzeiger, vii, 1884, pp. 119–123.)

On the literature and systematic relations of the saccopharyngoid fishes.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 48–65.)

JOHN HENRY GURNEY,

Northrepps, Norwich, England.

On the species of the genus *Pernis* inhabiting Japan.

(The Ibis, 5th series, ii (No. 7, July, 1884), pp. 275–277.)

A list of the diurnal birds of prey, with references and annotations; also a record of specimens preserved in the Norfolk and Norwich Museum. By John Henry Gurney. London: John Van Voorst, 1 Paternoster Row, E. C. 1884. 8vo. i–xv; pp. 1–187.

Contains frequent references to specimens in the U. S. National Museum collection.

GWYNNE HARRIS HEAP,

Consul-General of the United States at Constantinople.

On an antique Roman mosaic from Carthage, now in the United States National Museum.

(Proc. U. S. Nat. Mus., vi, 1883 (1884), pp. 415–417.)

This is an interesting account of the discovery of the "Mosaic Lion," and the manner in which it was obtained by the British agent from an old Arab sheik.

HENRY WETHERBEE HENSHAW,

Ethnologist, Bureau of Ethnology.

Description of a new song sparrow from the southern border of the United States.

(The Auk, new series, i (No. 3, July, 1884), pp. 223–224.)

Melospiza fasciata montana. This paper is based entirely on specimens in the National Museum collection.

On a new gull from Alaska.

(The Auk, new series, i (No. 3, July, 1884), pp. 250–252.)

Larus nelsoni; type in the U. S. National Museum.

The shore larks of the United States and adjacent territory.

(The Auk, new series, i (No. 3, July, 1884), pp. 254–268.)

ERNEST INGERSOLL,

New Haven, Connecticut.

Snow-spectacles.

(Wide Awake, May, 1884. Five wood-cuts.)
Text and illustrations based upon Museum material.

JOHN MATTHEW JONES,

Waterville, Nova Scotia.

The mammals of Bermuda. By John Matthew Jones, F. R. S. C., Fern Lodge, Waterville, Nova Scotia. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 143–161.

[See under GEORGE BROWN GOODE and JOHN MATTHEW JONES.]

DAVID STARR JORDAN,

President Indiana University, Bloomington, Ind.

Notes on a collection of fishes from Pensacola, Fla., obtained by Silas Stearns, with descriptions of two new species (*Exocœtus volador* and *Gnathypops mystacinus*).

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 33–40.)

Note on *Ælurichthys eydouxii* and *Porichthys porosissimus*.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 40–41.)

An identification of the figures of fishes in Catesby's natural history of Carolina, Florida, and the Bahama Islands.

(Proc. U. S. Nat. Mus., vii, July 29, 1884, pp. 190–199.)

List of fishes collected in Lake Jessup and Indian River, Florida, by Mr. R. E. Earll, with descriptions of two new species.

(Proc. U. S. Nat. Mus., vii, Sept. 1, 1884, pp. 322–324.)

List of fishes collected at Key West, Fla., with notes and descriptions.

(Proc. U. S. Nat. Mus., vii, July 7, 1884, pp. 103–150.)

Notes on fishes collected at Guaymas, Mexico, by Mr. H. F. Emeric, with a description of *Gobiosoma histrio*, a new species.

(Proc. U. S. Nat. Mus., vii, Aug. 22, 1884, pp. 260-261.)

List of fishes collected in the vicinity of New Orleans, by Dr. R. W. Shufeldt, U. S. A.

(Proc. U. S. Nat. Mus., vii, Aug. 28, 1884, pp. 318–324.)

Descriptions of four new species of *Pœcilichthys* in the United States National Museum.

(Proc. U. S. Nat. Mus., vii, Sept. 27, 1884, pp. 477–480.)

The fishes of Florida Keys.

(Bull. U. S. Fish Com., iv, 1882 (1884), pp. 77–80.)

DAVID STARR JORDAN AND CHARLES H. GILBERT.

A review of the species of the genus *Calamus*.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 14-24.)

A series of specimens representing each of these species is in the United States National Museum.

Descriptions of ten new species of fishes from Key West, Fla.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 24-32.)

Typical specimens are in the United States National Museum.

Note on *Caranx ruber* and *Caranx Bartholomæi*.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 32-33.)

Note on *Calamus proridens*, a new species of *Calamus*.

(Proc. U. S. Nat. Mus., vii, July 8, 1884, p. 150.)

Description of *Sciæna sciera*, a new species of *Sciæna* from Mazatlan and Panama.

(Proc. U. S. Nat. Mus., vii, Sept. 27, 1884, pp. 480-482.)

DAVID STARR JORDAN AND SETH E. MEEK.

List of fishes observed in the Saint John's River, at Jacksonville, Fla.

(Proc. U. S. Nat. Mus., vii, Aug. 5, 1884, pp. 235-237.)

Description of four new species of *Cyprinidæ* in the United States National Museum.

(Proc. U. S. Nat. Mus., vii, Sept. 27, 1884, pp. 474-477.)

Description of *Zygonectes zonifer*, a new species of *Zygonectes*, from Nashville, Ga.

(Proc. U. S. Nat. Mus., vii, Sept. 27, 1884, p. 482.)

DAVID STARR JORDAN AND JOSEPH SWAIN.

Descriptions of Scaroid fishes from Havana and Key West, including five new species.

(Proc. U. S. Nat. Mus., vii, July 1, 1884, pp. 81-102.)

Notes on fishes collected by David S. Jordan at Cedar Keys, Fla.

(Proc. U. S. Nat. Mus., vii, Aug. 5, 1884, pp. 230-234.)

A review of the American species of marine *Mugilidæ*.

(Proc. U. S. Nat. Mus., vii, Aug. 22, 1884, pp. 261-275.)

A review of the species of the genus *Hæmulon*.

(Proc. U. S. Nat. Mus., vii, Aug. 28, 1884, pp. 281-317.)

A review of the American species of *Epinephelus* and related genera.

(Proc. U. S. Nat. Mus., vii, Sept. 17, 1884, pp. 358-410.)

A review of the species of *Lutjaninæ* and *Hoplopagrinæ* found in American waters.

(Proc. U. S. Nat. Mus., vii, Sept. 19, 1884, pp. 427-474.)

JOHN HENRY LEFROY,

Athenæum Club, London.

The Botany of Bermuda. By General Sir John Henry Lefroy, F. R. S., Athenæum Club, London. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 33–141.

MEEK, SETH E.

[See under DAVID STARR JORDAN and SETH E. MEEK, and under JOSEPH SWAIN and SETH E. MEEK.]

CLINTON HART MERRIAM,

Locust Grove, N. Y.

On a bird new to the Bermudas, with notes upon several species of rare or accidental occurrence in these islands. By Clinton Hart Merriam, M. D. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 281–284.

EDWARD W. NELSON.

On the source of the jadeite implements of the Alaskan Innuits.

(Proc. U. S. Nat. Mus., vi, 1884, pp. 426–427.)

Extract from a letter to Professor Spencer F. Baird.

Brief diagnoses of two new races of North American birds.

(The Auk, new series, i (No. 2, April, 1884), pp. 165–166.)

Picoides tridactylus alascensis and *Astur atricapillus henshawi*; the types of which are in the U. S. National Museum collection.

The breeding habits of the pectoral sandpiper (*Actodromas maculata*).

(The Auk, new series, i (No. 3, July, 1884), pp. 218–221.)

A very interesting account of the habits of the species named, based upon observations made in Alaska, while in the service of the U. S. National Museum.

A new geographical race of the mountain sheep (*Ovis montana*, Dalli, var. nov.) from Alaska.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 12–13.)

Describes a white race of the mountain sheep found in the mountains of Alaska.

CHARLES C. NUTTING.

On a collection of birds from Nicaragua. [Edited by R. Ridgway.]

(Proc. U. S. Nat. Mus., vi, 1883 (1884), pp. 372–410.)

These signatures run from December 29, 1883, to April 11, 1884.

I.—San Juan del Sur, 70 species.
II.—Sucuyá, 88 species.
III.—The island of Ometépe.
IV.—Los Sábalos, 80 species.

The new species, with one exception, are all from Los Sábalos, and are as follows: (1) *Geothlypis bairdi*, Nutting; (2) *Oryzoborus salvini*, Ridgw.; (3) *O. nuttingi*, Ridgw.; (4) *Contopus depressirostris*, Ridgw.; (5) *Cymbilamus lineatus fasciatus*, Ridgw.; (6) *Grallaria intermedia*, Ridgw. (from Costa Rica); (7) *Porzana leucogastra*, Ridgw. The technical matter in this paper, including nomenclature, is by the editor.

TEMPLE PRIME,

New York, N. Y.

Description of a new species of *Sphærium*.

(Proc. U. S. Nat. Mus., vii, July 7, 1884, pp. 102–103.)

SAVILE G. REID,

Royal Engineers, London.

The birds of Bermuda. By Captain Savile G. Reid, F. Z. S., of the Royal Engineers, member of the British Ornithologists' Union, &c. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 163–279.

WILLIAM NORTH RICE,

Professor of Natural History, Wesleyan University, Middletown, Conn.

The geology of Bermuda. By William North Rice, Ph. D., Orange Judd, professor of geology and natural history in Wesleyan University. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 1–32.

J. T. ROTHROCK,

Professor of Botany, University of Pennsylvania, Philadelphia, Pa.

List of, and notes upon, the lichens collected by Dr. T. H. Bean in Alaska and the adjacent region in 1880.

(Proc. U. S. Nat. Mus., vii, June 3, 1884, pp. 1–9.)

PHILIP LUTLEY SCLATER,

Secretary of the Zoological Society of London.

A review of the species of the family Icteridæ. (Part iii. Agelæinæ.)

(The Ibis, 5th series, ii (No. 5, January, 1884), pp. 1–27. Pl. i.)

A review of the species of the family Icteridæ. (Part iv. Aniscalinæ.)

(The Ibis, 5th series, ii (No. 6, April, 1884), pp. 149–167. Pl. v.)

Remarks on two rare American Oscines.

(The Ibis, 5th series, ii (No. 7, July, 1884), pp. 240–241. 1 plate.)

Idiopsar brachyurus, Cass., *Acanthidops bairdi*, Ridgw.; the types of both and only known specimens belonging to the National Museum, and sent to Dr. Sclater for examination.

R. BOWDLER SHARPE,

Senior Assistant, Zoological Department, British Museum (South Kensington), London.

A note on the genus *Progne*.

(The Auk, i, July, 1884, pp. 367–368.)

ROBERT WILSON SHUFELDT,

Captain, Medical Corps, U. S. Army.

Concerning some of the forms assumed by the patella in birds.

(Proc. U. S. Nat. Mus., vii, Sept. 1, 1884, pp. 324–331. Seven figures.)

Observations upon a collection of insects made in the vicinity of New Orleans, La., during the years 1882 and 1883.

(Proc. U. S. Nat. Mus., vii, Sept. 1, 1884, pp. 331–338. One figure.)

ELISHA SLADE,

Somerset, Mass.

On domesticated hybrid ducks (*Anas boschas+obscura*).

(Proc. U. S. Nat. Mus., vii, June 11, 1884, p. 66.)

SIDNEY I. SMITH,

Professor of Comparative Anatomy, Yale College, New Haven, Conn.

On some new or little known decapod crustacea, from recent Fish Commission dredgings off the east coast of the United States.

(Proc. U. S. Nat. Mus., vii, Sept. 27, 1884, pp. 493–511.)

Crustacea of the Albatross dredgings in 1883.

(*Am. Journ. Sci. and Arts*, xxviii (*July* 1884), pp. 53–56; *Am. Mag. Nat. Hist.*, xiv (*No.* 81, *Sept.* 1884), *pp.* 179–183.)

"A brief review of the results of the study (by the author) of the higher Crustacea" collected during the deep-sea explorations of the United States Fish Commission in 1883, which included some of the most important dredgings yet made. The explorations extended from off Cape Hatteras to the region of George's Bank. The author enumerates sixteen species of Crustacea with well developed eyes in normal position, from depths of 2,030 to 2,949 fathoms.

Report on the Decapod Crustacea of the Albatross dredgings off the east coast of the United States in 1883.

(*Rep. U. S. Comm. Fish and Fisheries*, 1882 (1884), pp. 345–426, (1–82), *plates* 1–x.)

Also printed as author's extra with same pagination, and with cover and full title-page.

Sixty-seven species are described or mentioned, of which eighteen are new; three new genera are also described, and one new family defined, *Glyphocrangonidæ*, p. 364. The descriptions, especially of new species, are very full, giving complete measurements and data as to distribution. The plates are photo-engravings from drawings by J. H. Emerton and the author.

The new genera described are as follows:

	Page.
Ethusina	349
Parapasiphæ	383
Benthæcetes	391

Following are the new species described:

Ethusina abyssicola (pl. ii, figs. 1, 1*a*)	349
Galacantha Bairdii	356
Pentacheles nanus	359
Pentacheles debilis	360
Pontophilus abyssi	363
Acanthephyra eximea	376
Notostomus robustus (pl. vii, fig. 2)	377
Pasiphæ princeps (pl. v, fig. 2)	381
Parapasiphæ sulcatifrons (pl. iv, fig. 4; pl. vi, figs. 1–7)	384
Parapasiphæ cristata (pl. v, fig. 3)	388
Parapasiphæ compta	389

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Benthesicymus ? carinatus (pl. x, figs. 6–7)	396
Benthesicymus ? sp. indet. (pl. x, figs. 3–5)	397
Amalopenæus valens (pl. x, fig. 2)	402
Aristeus ? tridens (pl. ix, figs. 1–6)	404
Hepomadus tener (pl. ix, figs. 7–8)	409
Hymenopenæus microps (pl. x, fig. 1)	413
Sergestes mollis	419

JOSEPH SWAIN.

[See under DAVID STARR JORDAN and JOSEPH SWAIN.]

JOSEPH SWAIN AND SETH E. MEEK.

Notes on the pipe-fishes of Key West, Fla., with description of *Siphostoma McKayi*, a new species.

(Proc. U. S. Nat. Mus., vii, Aug. 5, 1884, pp. 237–239.)

CYRUS THOMAS,

Ethnologist, Bureau of Ethnology.

Directions for mound exploration.

(Proc. U. S. Nat. Mus., vii, 1884, pp. 581–583.)
Also published as Museum Circular No. 28.

ADDISON E. VERRILL,

Professor of Zoology, Yale College, New Haven, Conn.

Notice of the remarkable marine fauna occupying the outer banks off the southern coast of New England, Nos. 9 and 10; by A. E. Verrill. Brief contributions to Zoology from the Museum of Yale College, Nos. lv and lvi.

(Am. Journ. Sci., xxviii (No. 165, Sept., 1884), pp. 213–220; (No. 167. Nov. 1884), pp. 378–384.)

The topics discussed are as follows: Work of the steamer Albatross in 1883; partial list of stations occupied by the Albatross in 1883; work of the steamer Albatross in 1884; character of the deep-sea deposits. These two papers give a general discussion of the results of the exploration of the Fish Commission steamer Albatross off the eastern coast of the United States during the two years mentioned. The following new species are described in footnotes:

HOLOTHURIOIDEA:	Page.
Benthodytes gigantea	216
Euphromides cornuta	217
ASTEROIDEA.	
Zoroaster diomedeæ	217
Archaster grandis	218
Archaster robustus	383
Archaster formosus	383
Benthopecten spinosus (gen. et sp. nov.)	218
Brisinga costata	382
Brisinga elegans	382
Ophiochiton grandis	384

	Page.
OPHIUROIDEA:	
Astronyx tenuispina	219
ANTHOZOA:	
Umbellula Bairdii	219
Kophobelemnon tenue	219
Scleroptilum gracile	219
Lepidogorgia gracilis (gen. et sp. nov.)	220

Notice of the remarkable marine fauna occupying the outer banks off the southern coast of New England, and of some additions to the fauna of Vineyard Sound.

(Rep. U. S. Comm. Fish and Fisheries, 1882 (1884), pp. 641–669.)

A general account of the scientific investigations of the U. S. Fish Commission during the summers of 1881 and 1882, with headquarters at Wood's Holl, Mass., abstracted from papers published in the American Journal of Science, vols. xxii–xxiv, 1881 and 1882. Tables are given of the deep-water dredging stations occupied by the steamer Fish Hawk. The topics more especially discussed are as follows: For 1881: Fishes, Mollusca; for 1882: evidence of great destruction of life last winter; abundance of life; list of deep-water Echinodermata taken by the Fish Hawk, 1880–1882; additions to the fauna of Vineyard Sound; surface dredgings. Numerous species of Mollusca and Annelids are redescribed from the American Journal of Science. One new species of Ophiuran, *Ophioscolex quadrispinus*, Verrill, is described on page 661, and one new Planarian, *Stylochopsis zebra*, Verrill, on page 666.

Physical characters of the portion of the Continental Border, beneath the Gulf Stream, explored by the Fish Hawk, 1880 to 1882.

(Rep. U. S. Comm. Fish and Fisheries, 1882 (1884), pp. 1045–1057, plates 1–5.)

After a general introduction, the following topics are discussed: Influence of the Gulf Stream; nature and origin of the sediments; occurrence of fossiliferous magnesian limestone nodules; evidence of the existence of light at great depths. The plates are as follows: 1. Southern coast of New England to the Gulf Stream slope, showing lines of depths and positions of the principal dredging stations of the U. S. Fish Commission. 2. To illustrate the relative slope or profile of the bottom, from the shore to the Gulf Stream slope, and across portions of the slope in several lines. 3. Temperature curves at the bottom and surface, and at 5, 10, and 20 fathoms, and extending from the shore to near the 800-fathom line on the Gulf Stream slope. 4. Temperature curves at the surface and bottom, and at the intermediate depths of 5, 10, 20, 30, and 50 fathoms, arranged according to the distance in miles from the shore. 5. Temperature curves at the bottom and surface, and at intermediate depths of 5, 10, 20, 30, 50, and 100 fathoms.

SAMUEL T. WALKER.

On the origin of the fossil bones discovered in the vicinity of Tise's Ford, Florida.

(Proc. U. S. Nat. Mus., vi, 1884, pp. 427–429.)

Extract from a letter to Prof. Spencer F. Baird.

CHARLES W. WARD.

Notes on *Ardea wardi*, Ridgw.

(The Auk, i, April, 1884, pp. 161–163.)

With special reference to specimens in the National Museum collection.

HENRY E. WEBSTER,

Professor of Natural History, Rochester University, Rochester, N. Y.

The Annelida from Bermuda, collected by Mr. G. Brown Goode. By Henry E. Webster, professor of natural history in the University of Rochester, Rochester, New York. ——. From Bulletin No. 25, U. S. National Museum. Washington: Government Printing Office. 1884. 8vo. pp. 305–327.

FRANCIS WINSLOW,

Lieutenant, U. S. Navy.

Memorandum of the present condition and future needs of the oyster industry.

(Bull. U. S. Fish Com., iv, 1884, pp. 233–234.)

Notes upon oyster experiments in 1883.

(Bull. U. S. Fish Com., iv, 1884, pp. 354–356.)

PART V.

LIST OF ACCESSIONS TO THE U. S. NATIONAL MUSEUM DURING 1884.

APPENDIX.

LIST OF ACCESSIONS TO THE MUSEUM IN 1884.

Abbe, C. E. 14671. Insect from Massachusetts.

Abbey Coal and Mining Company. 15361. Two boxes, specimens of coal and its associates from Missouri.

Abbie, S. G. 14339. Skeletons of foxes, mink, and porcupine from Maine.

Abbott, E. L. 14583. Package of specimens of fulgurites from Illinois.

Academy Natural Sciences, Philadelphia, Pa. 14074, 14146, and 14283. Alcoholic specimens of reptiles; package of alcoholic reptiles. (Loan, returned.)

Ackerman, Ensign A. A., U. S. N. 14287 and 15042. Bones of whale and bone implements, Indian arrow-heads and chips from Disco Island and Greenland.

Ackerman, F. 15191. Stone ax from Ohio. (Lent.)

Adams, J. B. 13914. Specimens of birds' skins from New Mexico.

Adams, S. T. 14086. Specimen of mammal, shells, &c., from Dakota.

Adams, W. H. 14434 and 14824. Six boxes of specimens of sulphur and copper ore from Louisa County, Virginia.

Agens, Alexander M. 14313. Piece of felt which covered the coffin of the late Captain DeLong.

Aiken, Charles E. 14808. Birds' skins from Colorado.

Aistrop, Z. T. 14273. Samples of minerals from California.

Ajax Metal Company. 15344. Specimens of the Ajax metals from the works of the company.

Alderson, J. D. 14679. Specimen of ore from West Virginia.

Alexander, W. D. 14291. Specimen of barking sand from sand-hills of Maua Kauai.

Alford, L. S. 15424. Specimen of graphite from Franklin County, North Carolina.

Allen, F. S. 14552 and 14569. Photograph and model of an improved life boat and car from Cuttyhunk, Mass.

Allen, J. E. 14695. Specimen of insect from Indian River, Florida.

Allien, Mr. . 15173. Charm made from skull of marten, mounted in silver, from Russia.

Allis, E. W. 14688. Wooden model of stone implement, Michigan.

Allison, J. D. (through Judge L. C. Johnson). 14570. Box of alcoholic fishes from Alabama.

Alward, G. L. (Grimsby, England). 14514. Two pictures of fishing vessels used by English fishermen.

American Institute of Mining Engineers. 14081, 14116, 14233, 14243, and 14407. Fifteen boxes of iron and steel; 6 boxes of rock specimens, and geological maps from Sweden; 3 boxes, collection of salts, &c, from Germany, and 18 boxes of models of blast furnaces, &c.

Amend, B. G. 15079. Two specimens of minerals.

American Ship Windlass Company. 14636. Two boxes containing models of steam windlasses from Rhode Island.

Andrews, George S. 15141. Specimen of garnet in granite from Connecticut.

Andrews, Joseph D. 14382. Specimens of ore from Arizona.

Andrews, R. H. 14735. Two specimens of turtle eggs from Maryland.

Andrews, W. H. 14740 and 14795. Collection of minerals and Indian relics from various localities in New York.

Ansonia Brass and Copper Company. 14344, 14863, and 15133. Barrel, keg, and two boxes of brass and copper specimens.

Archer, B. V. 13924. Specimen of large leather-back turtle from Key West, Fla.

Arlington Mills. 15125. Specimens illustrating the manufacture of worsted and cotton yarns.

Army Medical Museum. 14053, 14076, and 14810. Collection of stone relics, foods, fossils, gold, silver and copper ores, alcoholic fishes, models of Eskimo boats, fragments of pottery, &c., from various localities, and four specimens of deformed crania. (Lent.)

Arnheim, J. S. 14186. Specimens of reptiles from California.

Ashburner, C. A. 15248, 15294, and 15333. Model of the Panther Creek Anthracite Coal Basin and maps. (Purchased for N. O. Exposition.)

Atkins, Charles G. 14011 and 14398. Three cases containing a series of embryo salmon in alcohol, glycerine, and water from Grand Lake Stream and Orland, Me., also bundle of poles and net.

Atkinson, Edward. 15179. Specimens of cotton and silk fabrics from China and Japan.

Atkinson and Filmore. 15292. Boat model. (Lent.)

Atwater, W. O. 15454. Collection of foods.

Aymé, Louis H. 15230. Three boxes, one barrel and bundle ethnographic specimens from Mexico.

Babitt, E. & F. 14050. Samples of water from artesian wells 2,120 feet deep for report.

Babcock, General O. E., U. S. A. 14060, 14067, 14317, and 14380. Specimens of pottery, bones, charcoal, and shells from shell mound on north bank of Halifax River, also birds and bat from Florida, and two bottles of water from Maryland.

Babcock, Mrs. O. E. 14617. Box fragments of pottery found near Mosquito Inlet, Florida.

Babcock, S. E. 14413. Specimens of stone implements from South Carolina. (Loan.)

Bailey, E. M. 15167. Specimens of minerals from Maine.

Bailey & Co., John T. 14675. Samples of cordage.

Bailey, Robert T. (through W. J. Etzell.) 14625. Specimen of fungi from South Carolina.

Bailey, W. H. 14633. Alcoholic specimens of fish from off Cape Fear, North Carolina.

Bailly, Jules. 15355. Specimens of mounted frogs.

Baird, Miss Lucy. 14197 and 14335. Alcoholic specimens of earthworm, and collection of minerals.

Baird, Prof. S. F. 14614 and 15479. Box, specimens of fish from Wood's Holl, Mass., and quahog pearl.

Baird, Mrs. Spencer F. 14447. An old-fashioned English "coffee biggin."

Baker, A. B. 15035. Two boxes of mammal skins from Kansas.

Balbach & Son, E. 15203. Four boxes gold, silver, copper, lead, &c.

Baldwin Locomotive Works. 14705. Four photographs of mine locomotives.

Ballew, W. W. 14661. Specimens of rocks from Arkansas.

Barber Flax Spinning Company. 14745. Specimens of Dutch, Canadian, Irish, French, and Flemish flax.

Barclay Coal Company. 14760. Box specimens of bituminous coal and its associates from Long Valley mine, Pennsylvania. (Collected by James Temple Brown.)

Barker, A. S., U. S. N., commanding U. S. S. Enterprise. 14805 and 14865. Specimens of ocean bottom obtained during cruise from United States to Asiatic station, via Cape of Good Hope; also, box of photograph negatives.

Barker, Charles D. 14170. Specimen of pottery from Florida.

Barnard, Edith S. 14328, Specimen of alligator in flesh.

Barnum, Bailey & Hutchinson. 14360, 14363, 14401, 14541, 14594, 14613, 14709, 14894, 15193, 15221, 15393, 15485, and 15510. Ten specimens of monkeys, one baboon, one eland, one harnessed antelope, three leopards, and one peccary, all in flesh.

Barnum, P. T. 15457. Plaster bust of Phineas T. Barnum.

Barringer, W. D. 14970. Specimen of fossil from Texas.

Barroll, Henry H., Lieut., U. S. N. 14829. Alcoholic specimen of crab from Lamock Island, China.

Barrows, W. B. 14939. Specimens of turtles from Connecticut.

Barton & Logan. 14507. Young specimen of monkey in flesh.

Bartlett, Comd'r John R., U. S. N. 14027, 14554, and 15459. Two bottles of alcoholic specimens of marine invertebrates, &c., picked up at sea; specimens of pumice from Straits of Sunda and volcanic dust from Krakatoa.

Butchen, John S. F. 13952, 14007, 14128, 14144, 14164, 14191, 14353, 14549, 14752, 15023, 15166, 15215, and 15272. Large collection of building and ornamental stones, ores, rock specimens, German lithographic stone, &c., Illinois, Arizona, New Mexico, Missouri, Texas, Kansas, Florida, Colorado, Michigan, and line of Mexican Central Railroad.

Baeder, Adamson & Co. 14858 and 15119. Collection of materials illustrating the manufacture of sand paper and emery cloth and specimens of minerals.

Bean, Dr. T. H. 14075, 14350, 15031, and 15039. Eight boxes alcoholic specimens of fishes and invertebrates and pigeon-hawk from Long Island, New York; specimen of barred owl shot in the Smithsonian grounds, and eight fresh specimens of fishes from Washington market.

Bearden, C. C. 14065. Specimens of insect from Texas.

Beardsley, Mrs. A. J. 15052. Specimens of minerals from Missouri.

Beatty, Joseph H. 14751, 15020, and 15036. Three packages of birds' skins from various localities.

Beatty, T. W. 14782. Specimen of Indian pottery from South Carolina. (Loaned.)

Beauchamp, W. M. 14175. Specimens of crania, shells, concretions, &c., from New York.

Beck, Hon. James B. 13909. Four specimens of ducks in flesh from Potomac River.

Belding, L. 13960, 14176, 14185, 14318, 14488, and 15216. Six packages of dried and alcoholic birds' skins from California.

Bell, James. 14100, 14533, and 14575. Specimens of living snakes, frogs, and two skins of Florida screech owl.

Bell Smelting Company. 15532. Specimens of copper ores and products from Butte, Mont.

Bell, W. M. 14515. Specimen of fresh fish from Delaware.

Bendire, Capt. Charles, U. S. A. 13916, 14256, and 14532. Four boxes of birds' skins; tank of alcoholic fishes, reptiles, insects, &c., from vicinity of Fort Klamath, Oreg.; also, large collection of birds' nests and eggs from Western North America, New York, and Europe.

Béné R. T. 15445. Exhibit of ostrich feathers, showing process of manufacture.

Benjamin, Cyrus M. 14177. Two specimens of ores from Connecticut.

Benner, D. J. 15016. Specimen of grass coat from Popoyan, United States of Colombia.

Berendt, Dr. G. (Berlin, Germany). 14157. Specimen of sand (Tónendor).

Bergens Museum (Bergen, Norway). 14499. Box of birds' skins and invertebrates from Norway.

Berlin Museum (through Prof. A. Bastian). 14681. Cast of Buddha's foot-print, from Buddhafaya, the most venerated spot of the Buddhists.

Bernheisel, S. 14676. Specimens of minerals from Pennsylvania.

Berrini, Dr. Josie Carlos. 15491. Specimens of vegetable fibers extracted from plants of Brazil.

Bertha Zinc Company. 15245. Specimens of zinc ores from Virginia.

Bessel, Gebruder. 14356. Two cases and five casks of graphite crucibles and large piece of graphite from Dresden.

Bianchi & Co., F. 15396. Samples of feathers used in the millinery business.

Bicknell, Eugene P. 14084. Two specimens of birds' skins from Riverdale, N. Y.

Bigelow Carpet Company. 15084. Samples of wools and carpets.

Bishop, J. N. 14565. Insect from Connecticut.

Bissel, John G. 14180. Sample of dust from surface of 5 feet of snow which fell February 29, 1884.

Bissel, John H. 15081. Specimen of fresh fish from Detroit, Mich.

Blackford, Eugene G. 14059, 14151, 14217, 14288, 14311, 14395, 14406, 14418, 14455, 14480, 14717, 14762, 14815, 14864, 14918, 14930, 14935, 15006, 15060, 15091, 15155, 15332, and 15443. Large collection of fresh fishes, including salmon, from Atlantic and Pacific coasts, halibut weighing 430 pounds, pompana, weight 36 pounds, black and sea bass, green and logger-head turtles, crabs, &c., from New York market, Canada, Newfoundland, England, West Indies, and Gulf of Mexico.

Blackman, W. S. 14626. Specimen of ore from Indiana.

Blackman, Z. 14556. Package of clay from Louisiana.

Blackiston, Capt. T. W. (London, England). 14165. Collection of nearly 500 Japanese birds' skins.

Blake, W. P. 14517. Sample of wool from mountain goat.

Blockman, L. A. 15434. Specimen of shells, &c., from San Diego, Cal.

Bloomfield, Loyd M. 14468. Specimen of birds' nests and eggs from Ohio.

Blossburg Coal Company. 15033. Box of fire-clay, slate, bones, fossils, mining tools, &c., from Pennsylvania.

Boardman, George A. 14248 and 14257. Two specimens of birds' skins. from Florida; also 6 eggs of the limpkin.

Bolles, Lieut. T. Dix, U. S. N. 15153. Two boxes of minerals, and ethnology from Alaska.

Bonaparte, Du Prince Rowland (St. Cloud, France). 13991 and 14883. Two collections of photographs of Kalmouks.

Bond, Frank U. 15416. Alcoholic specimens of crayfishes from Wyoming.

Bonelli, George. 14279. Specimen of mineral from Utah.

Booth, A. 14296. Specimens of fresh fish (*Clupea sapidissima* and *Oncorhynchus nerka*) from Columbia River.

Booton, J. K. 14508. Specimens from Luray, Va.

Bowker, Torrey & Co. 15024. Specimens of African onyx and breccia (red).

Bowron, William M. 15083. Box of fossils and shells from Tennessee.

Boyce, Mrs. 14951. Box specimens of shells from California.

Boyd, James. 14527. Specimens of asbestos from Canada.

Boyle, John T. (*sculptor*). 14066. Original model of the statue of Indian chief in Lincoln Park at Chicago, Ill.

Boyton, Paul. 15522. Specimens of old gold and silver ornaments from Ancon. (Purchased.)

Brackin, A. H. 14340. Specimens of minerals from North Carolina.

Bradfute, W. R. 15290. Specimens of rocks from Nevada.

Bradstreet, E. C. 15432. Specimen of ore from Colorado.

Brady, Prof. G. S. 14167 and 14181. Collection of free-swimming copepods from England and building stones from New York.

Brakeley, John H. 14476. Bottle of alcoholic fishes from New Jersey.

Brandenberger, William. 14572 and 14730. Package of ores from California.

Brazil, Government of. 14366. Large collection of foods, mats, hats, shoes, fans, aprons, pipe-stems, nuts, baskets; also samples of rain cloak and cape, made of straw leaves for making hats; brooms, pipe-bowls, tooth-picks, scrubbers, dippers, model of Brazilian boat, &c.

Brenner, D. W. 14563. Package of copper ore from Loudoun County, Virginia.

Bretz, George N. 14853 and 14907. Box of negatives of outside and inside views of coal mine of Shenandoah district, Pennsylvania. (Purchase, New Orleans Exhibition.) Also photograph of coal-breakers.

Brewster, William. 15478. Box of birds' skins.

Bridges, R. W. 14446 and 14816. Specimens of minerals from Maryland.

Brighthope Railway Company. 15233. Specimens of coal from Virginia.

Briscoe, S. B. 14849 and 14875. Miners' tools, pick, and 3 drills. (Purchase, New Orleans Exhibition.) Also miner's old outfit, coat, boots, &c.

British Museum (*London, England*). 14124, 14158, 14610, and 15400. Large collections of birds' skins from India, Asia, Africa, and Australia. Alcoholic specimens of bats, and catalogues of the museum.

Broadhead, G. C. 15256. Three specimens of fossils from Missouri.

Brock, James A. 14391. Specimen of Indian pottery from Florida.

Brodie, David. 14953. Specimens of Carboniferous fossils from Connecticut.

Brookins, Dr. A. B. 14600. Specimens of insects from Florida.

Brooklyn Mine. 15238. Specimens of ores from Utah.

Brown, Charles F. 15037. Minerals from Arkansas. (Purchase, New Orleans Exhibition.)

Brown, E. L. 14182. Box of stone relics and 5 moss agates from Wisconsin.

Brown, George T. 15069. Specimens of insects from South Carolina.

Brown, G. W. 14498. Specimen of stone relic from West Virginia. (Purchase.)

Brown, James Temple. 14845, 14847, 14857, 14949, 14956, 14979, and 15378. Specimens of coal, iron ores, lepidodendron, slate, and fossils. Three specimens of iron bolts reduced by action of mine water, and two photographs of fans for ventilating coal mines from Pennsylvania, Virginia, and New York.

Brown, John P. 13901 and 13992. Specimen of calcareous tufa and skin of owl from Washington Territory.

Brown, Walter W. 14069. Photograph copy of the Declaration of Independence of the United States.

Buchsbaum, H. 13954. Specimen, in the flesh, of Mexican hairless dog.

Buck, Stuart M. 14592. Specimens of coal from West Virginia.

Buffum, Allie J. 14201. Specimens of rocks from Wisconsin.

Burchard, Horatio C. 14937. Box containing two copies in bronze of all medals issued by the United States Government.

Burch and Moore. 14529. Fresh specimen of fish from Potomac River.

Bureau of Ethnology. 13948, 13987, 14009, and 14255. Large collection of pottery, stone relics, human skulls, bones, from mounds of United States; also 362 archæological specimens collected during the fiscal year ending June 30, 1883.

Bureau of Navigation, U. S. N. 14459. 168 specimens of bottom soundings from the cruise of the steamer Albatross during winter of 1884, in Gulf of Mexico and West Indies.

Burhans, C. S. 15326. Specimens of minerals from New York.

Burlington Manufacturing Company. 14768. Specimen of ophiolite from Port Henry, N. Y.

Burns, Frank. 13920. Specimen of mound pottery from Alabama.

Bush, Mrs. A. E. 14427 and 14431. Specimen of crustacea and shells from San Pedro, Cal.

Bush, William R. 14268. Specimen of rock from Florida.

Butler, Col. A. P. 14503. Specimen of Indian burial urn from South Carolina.

Byrnes, W. B. 15231. Drawing of the bark Saratoga entering and leaving the port of Palermo.

Cable Flax Mills (E. A. Hartshorn, president). 14720. Specimens of flax twine, &c.

Caldwell, John W. 14041. Specimen of silver medal, loaned for copy.

Call, R. Ellsworth. 13905, 14143, 14561, 14683, 14691, 14870, 14902, and 15260. Specimens of shells, fresh specimen of bat, alcoholic reptiles, crustaceans, and 175 specimens of *Limax maximus*, from Potomac River, California, Iowa, and District of Columbia; also leeches and mollusca from Utah and Nevada.

Call, Mrs. R. E. 15027. Alcoholic specimen of rattlesnake and spider from Illinois.

Callender, Mr. (London, England). 13990. Sample of bituminous insulation of wire.

Cameron, J. P. 14618. Specimen of ore from Texas.

Camp, Mrs. Norman W. 15076. Wax portraits of antique manufacture. (Deposited.)

Canfield, Dr. C. A. 14516. Sample of down of young *Cathartes californiensis.*

Cannon, Dr. G. 15320. Specimens of minerals from Northern New York.

Cargill, Samuel G. 14980. Three photographic views of the Lowmoor Iron Company's works.

Carlton, Miss Hattie. 15537. Small collection of arrow-points, shells, minerals, &c., from Arizona.

Carlton, J. H. 14384. Two boxes of stone implements from Arizona.

Carmack, G. L. M. 15107 and 15475. Specimens of ores and minerals from Washington Territory.

Carnegie Bros. & Co. 15342. Sample of coke from Pennsylvania.

Carry, Miss C. 15425. Specimen of pen and utensils, contract dated 1722, and almanac of 1780.

Carter, C. P. 14893. Five models of boats from Maine.

Carter & Tucker. 15305. Specimen of graphite from Heron mine, North Carolina.

Catlin, J. C. 13937. Specimen of red squirrel's nest from Ohio.

Catton, John F. 13925. Specimens of mound relics and bird's nest from North Carolina.

Cave Mine. 15500. Specimens of ores from Utah.

Cedar Grove Mining Company. 15217. Specimen of coal from West Virginia.

Central Mine Company. 14959. Two boxes and two large pieces of copper ore and associates from Michigan.

Chadwick & Co. 15172. Specimen of candle made from bees-wax from Spain. (Purchased.)

Chamberlain, C. W. 15428. Specimens of birds' skins.

Chapin, W. C. 15406. Specimen of niter from White Plains, Nev.

Chapman, W. A. 15413. Specimens of fossils from Arkansas.

Chase, Lieut. George F., U. S. A. 14544. Two living specimens of Gila monster (*Heloderma suspectum*) from Arizona.

Chatard, Dr. F. E. 14031. Specimens of minerals from Maryland.

Chatard, T. N. 14785, 15074, 15222, 15268, and 15338. Specimens of minerals, gold ore, dunite, and garnetite from North Carolina and Georgia.

Chateaugay Ore and Iron Company. 14775 and 14784. Specimens of iron ores and products.

Chester, Capt. H. C. 14329 and 15270. Four water-color sketches of vessels and sample of folding anchor.

Chickering, Prof. J. W. 14148. Two abnormal feet of pig (*Sus scrofa*).

Christy & Co., Thomas. 14448, 14449, 14641, 14741, 14754, and 14799. Samples of Rhea seed; also specimens of seed of *Cannabis sativa* which yields bang or hemp, and is largely grown in Persia; specimen of thiolyte and mineral substance from England; also living seeds and oil of crab nuts from West Indies.

City Rock Mines. 15192. Two boxes specimens of ores from Utah.

Clark, A. Howard. 15015, 15049, and 15065. Specimens of stone killicks; specimen of toggle iron used in capturing swordfishes; mackerel reamer (old style); swordfish iron, fisherman's scrubbing-board, and *os penis* of seal from Massachusetts and Iceland.

Clarke, Prof. F. W. 14301, 14764, 14832, and 15017. Specimen of iridosmine, minerals, gems, and cassiterite, from Maine, California, France, Norway, and Peru; also specimen of hair ball from stomach of Texas steer.

Clarke, M. C. 14396. Two living specimens of fish from Red River, Tennessee.

Clark, W. M. 14019. Specimens of stone relics, pottery, and skull from mounds in Tennessee.

Clayton, Prof. J. E. 15130 and 15161. Specimens of ores and minerals from Utah.

Clemens, George S. 14842. Box of anthracite coal carvings from Pennsylvania. (Purchase, New Orleans Exhibition).

Clements, Hon. J. C. 14235. Specimen of rock from Georgia.

Cleveland, Mrs. M. (Paris, France). 13970 and 14904. Case containing Sicilian harness.

Coale, H. K. 13927, 14261, 14701, 14886, 15029, 15154, and 15357. Large collection of birds' skins from United States, Europe, and India.

Cochran, A. B. 14873. Section of wall used to extinguish fire in Kehley's Run colliery, Pennsylvania, and chart of anthracite coal fields.

Coffin, C. E. 14560 and 15143. Samples of pine and oak wood charcoal and pig-iron borings from Maryland.

Cole, John. 13955, 14118, and 14537. Specimens of minerals and ores from Virginia.

Collector of Customs, San Francisco, Cal. 14270. Specimen of iguana, dried and eviscerated.

Coleman, Edward C. 14510. Sample of earth from Wisconsin for report.

Coleman, W. W. 15146. Bottle alcoholic specimen of squid from Chesapeake Bay.

Collins, A. J. 14381. Specimen of ore from Tennessee.

Collins, Joseph W. 14095, 14954, 14961, 15108, and 15132. German-silver seine-mending needle, collection of boat models from Massachusetts; also skull and antlers of deer from Holsteinberg, Greenland. (Purchased.)

Collins, W. H. 15509. Specimen of rabbit in flesh.

Colman, Benjamin. 15054. Specimens of minerals from Missouri.

Colorado Silver Mining Company. 15497 and 15531. Specimens of gold, silver, and copper ores, and products from Colorado.

Conant, Ambrose. 14184. Samples of minerals from Ohio.

Conglomerate Mining Company. 14927. Four boxes specimens of copper ores and associates from Delaware, Mich.

Conklin, W. A. (Superintendent Central Park Menagerie, New York). 14173, 14190, 14250, 14343, 14372, 14419, 14453, 14793, 14915, 14992, 15139, 15157, 15197, 15202, 15263, and 15456. Six specimens of monkeys, baboon, python, giant kangaroo, domestic Chinese fowl, hair-footed jerboa, white crane, condor, civet cat, fruit-eating bat, fawn, and 2 specimens of lemur, all in flesh.

Connor, J. C. 14649. Specimens of minerals from Alabama.

Consolidated Bobtail Mining Company. 15410 and 15411. Specimens of retorted gold and gold amalgam (purchased); also specimens of gold ore (presented).

Cook, J. W. 14211. Skin of *Grus americana* from Dakota.

Cope, Prof. E. D. 14068. Specimen of *Cacatua eos*, in flesh, from Australia.

Corcoran Art Gallery. 15455. Fine collection of Japanese musical instruments.

Cory, Charles B. 13907, 14394, and 14421. Collection of birds' skins from Pacific Ocean between San Francisco and Sandwich Islands, and San Domingo, West Indies.

Coryton, E. (London, England). 14403. Seven specimens of ancient copper coins.

Coues, Dr. Elliott, U. S. A. 15521. Specimen of squirrel from Arizona.

Cowan & Bliss. 15096 and 15097. Five boxes of zinc ores, &c., from Missouri.

Cowles, Archie A. 15394. Specimen of bird's egg from Minnesota.

Cowles, J. P. 14093. Three Chinese sandals and square of brick tea.

Cox, L. A. 14070. Thirteen plaster casts of crinoids of the Keokuk beds, Iowa.

Cragin, F. W. 14942. Mounted specimen of bat, from Manhattan, Kans.

Craven, Dr. John J. 15134. Specimen of fresh fish from Great South Bay, Long Island.

Crawford, Dr. M. H., U. S. N. 15004. Package of shells, &c., from west Terra del Fuego, near Straits of Magellan, Patagonia.

Crawford, S. M. 14223. Box of fresh specimens of trout from Christine Lake, New Hampshire.

Crescent Coal Mines. 14997. Samples of coal and its associates from West Virginia.

Crockett, M. D. 14846. Slice of the Robertson County, Tennessee, meteorite.

Cromley, M. E. 14780. Specimens of insects from Colorado.

Crosby, W. O. 14941. Rock specimens from Massachusetts.

Crosse & Blackwell (London, England). 14559. Seventy-nine samples of food from England.

Cross, John. 14374. Specimens of fossil bone from Florida.

Crown Point Iron Company. 14885. Specimens of iron ores, pig iron, &c., from New York.

Crumb, Capt. C. H. 14933. Six specimens *Ammodromus maritimus* from Cobb's Island, Virginia.

Cushing, F. H. 15144. Serapi, breech-clout and coat.

Cushing, L. B. 15350. Three water-color sketches of boats.

Dabney, Dr. C. W. 14833. Specimens of tin ore from King's Mountain, North Carolina.

Daggett, R. M. 13904. Specimen of resonant or barking sands of Maua Kauai.

Dall, Rev. C. H. A. 15370. Samples of vegetable silk from India.

Danenhower, W. W. 14487. Suit of furs worn by Lieut. John W. Danenhower, late navigator of the United States Arctic yacht Jeannette, during his retreat through Siberia.

Daniels, Capt. John. 15528. Specimens of native silver and copper from Osceola mine, Michigan.

Daniels, O. E. 15280. Specimen of marine animal for name.

Davidson County, North Carolina. 15302, 15317, and 15421. Specimens of gold, silver, copper, and lead ores from North Carolina.

Davis Company, The. 14707. Specimens of pyrite from Massachusetts.

Davis, Dr. Edwin Hamilton. 15188. One hundred and three molds of stone implements from mounds in Mississippi Valley, and few showing Mexican, Central, and South American art. (Purchased.)

Davis, G. H. 14915. Specimen of bird from Iowa.

Davis, Jacob. 14156. Specimens of birds, in flesh, from Massachusetts.

Davis, Oliver. 14722. Specimen of soft-shell turtle (*Aspidonectes spinifer*) from Ohio.

Deardorff, Isaac N. 14423. Carved stone head from Ohio. (Loan.)

De Coene, J. (Rouen, France). 14410. Box of charts and maps of the river Seine.

De Johnge. 15174. Sample of glazed paper prepared with bone-black.

Delmege, Reid & Co. (Ceylon). 14114 and 14415. Collection of fibers, cordage, coffee, vegetable and essential oils, and plumbago.

Dennison Manufacturing Company. 15463. Samples illustrating the manufacture of sealing wax.

De Poincy, W. J. 14509 and 14505. Two packages of insects from Florida.

Desloge Lead Company. 15529. Specimens of lead ores from Missouri.

Devereux, A. 14995. Specimen of rock from Texas.

Devoe & Co., F. W. 15265. Collections of paints, brushes, &c., of animal origin.

Dewey, F. P. 14738, 14940, 15131, and 15194. Specimens of ores and minerals from New Jersey, Colorado, and Utah, and 2 bottles of iridosmine. (Purchased.)

Dickie, James. 15437. Three photographs and diagrams, with description of the new aqua-aerial or wave ship.

Diller, J. S. 15508. One hundred and fifty specimens of andesites from Mount Shasta, California.

Dimond, John. 15010. Specimen of California onyx.

Discover, Emanuel G. 14265. Specimen of rock from Wyoming.

Dobson, G. E. 14619. Alcoholic specimens of mammals, fishes, reptiles, &c., from England.

Dodds, Pardon. 14195. Specimen of ozocerite.

Dodge, E. G. 15323. Specimens of minerals from Saint Lawrence County, New York.

Doerflinger, Carl. 15374. Specimens of Potsdam fossils from Wisconsin.

Dolphin Manufacturing Company. 14975. Samples of Napier matting and hemp carpets from New York.

Donaldson, Thomas. 13985, 15201, 15345, 15384, and 15447. Specimen of turquoise from mine in Gonzales, Mexico; specimen of free gold (purchased); box of feathers used in manufactures; 6 boxes of gold quartz (Savage collection), and 15 large pieces of ores.

Donnell & Co., J. T. 14101. Large coil (1,200 pounds), specimen of ship cable.

Dore, Harry F. 15482. Specimens of land shells from Oregon.

Douglas, jr., J. 14504. Two specimens of coal from Arizona.

Dowell, B. F. 15135. Specimens fossils, minerals, shells, and fossil plants from Oregon.

Dowell, John. 14354. Mounted specimen of *Porzana jamaicensis*.

Downman, R. H. 14166 and 14295. Specimen of bird in flesh, and worms, from Virginia.

Dresel, Ensign H. G., U. S. N. 15040. Specimen of pigeon-hawk from Patchogue, L. I.

Drummond, A. J. 14103. Specimens of materials used for photographing on wood.

Duges, Prof. Alfred. Collection of fossil bones, birds' skins, starfishes, shells, and specimen of peccary, from Mexico.

Duguo, Capt. John. 14965, 14985, and 15048. Two specimens of cup sponges, specimen of coral and fish from fishing banks north of Iceland.

Duly, A. A. 15520. Specimen of fossil oyster from Potomac Creek.

Dunning, Philo. 14711. Alcoholic specimen of fish from Wisconsin.

Dutcher, William. 13902. Specimens of birds' skins from Long Island.

Dwight, jr., Jonathan. 14187. Specimens of birds' skins. (Loan.)

Dyer, W. M. 14249. Specimen of iron pyrites from West Virginia.

Dyke, E. B. 14632. Specimen of ore from Iowa.

Eakin, John R. 14905. Specimens of skulls, fragments of same, fossils, and stone implements, from near Washington, Ark.

Edson, J. B. 14646. Samples of zylonite (in sheet form).

Edwards, Vinal N. 14017, 14568, 15162, and 15446. Specimens of birds' skins, duck fossils, eels, parasites from fish, 22 bottles of dredgings, and specimen of variegated sea bass from Massachusetts.

Elliott, Henry W. 15405. Small collection of augite crystals from Alaska.

Ely, J. H. 14196. Specimen of halotrichite from Gila River, New Mexico.

Emma Mine Company. 15183. Specimens of silver and lead ores from the Emma mine, Utah.

Emmert, John W. 14292. Sample of ore from North Carolina.

Emmons, G. F. 15346. Specimens of rocks from Colorado.

Errico Brothers. 15148. Specimens of cameos, tortoise-shell, &c.

Esberard, F. A. M. (through Foreign Exhibition, Boston, Mass.). 14598. Cask containing 2 pieces of glazed and 101 pieces of unglazed pottery from Brazil.

Esperanza Marble Company. 15136 and 15247. Specimens of building stones and slabs of marble from New York.

Ewart, Prof. J. Cossar. 15169. Stocking made from bison hair, from Canada.

Faiche, John R. 14660. Specimen of crab from Chesapeake Bay.

Fairhurst, A. 14361. Box of Indian stone relics from Kentucky.

Fall Brook Coal Company. 14846 and 15003. Specimens of miner's clothing, outfit, &c. (purchased), and two boxes of coal, &c.

Farmer, Louis and Maurice. 14117. Specimens of cottons, fibers, manila, crude and manufactured, &c., from Port au Prince, Hayti.

Fayette Coal Company. 15274. Specimens of coal and slate from West Virginia.

Ferguson, Maj. T. B. 13969 and 13996. Specimen of clay, and owl in flesh, from South Carolina.

Ferry, Miss L. 14724. Specimens of beetles from Massachusetts.

Fetzer, G. W. 14512 and 14734. Specimens of minerals from Tennessee.

Fire Creek Coal and Coke Company. 15362. Two boxes of coal and coke from West Virginia.

First Japanese Manufacturing and Trading Company. 15190. Collection of Japanese fancy goods.

Fisher, William J. 14024. Two boxes, 1 keg, ornithological, oological, and ethnological specimens from Kodiak Island, Alaska.

Fisk, Eli C. 14952 and 15012. Specimens of insects from Illinois.

Fitzhugh, Nicholas. 14848 and 14876. Specimen of miner's pick, showing action of mine water, also specimens of coal, from Pennsylvania.

Fitzhugh, R. K. 15404. Specimen of epidote in quartz from Virginia.

Flint, Dr. J. M., U. S. N. 14130. Skull and bones.

Fogg & Son, *W. S.* 15234 and 15269. Collection of feather flowers and ornaments, also samples for filling for mattresses, pillows, &c.

Fontaine, *Professor.* 15064. Specimens of rocks from Virginia.

Foote, *A. E.* 14664, 14672, and 14860. Collection of minerals from England, Pennsylvania, and Kansas; 2 specimens of orthoclase and 7 of microline. (Purchase, New Orleans Exhibition.)

Ford, *J. B.* 14967. Specimen of mineral from boiling spring, Arizona.

Ford, *S. W.* 15255. Two specimens of fossils from New York.

Foster, *J. H.* 15005. Specimen of discoidal stone from South Carolina.

Foster, *N. A. & J. E.* 14110. Specimen of minerals from North Carolina.

Fougera & Co., *E.* 13977. Collection of materia medica from New York.

Fowler, *Dutton.* 14437. Specimen of mineral from Nevada.

Fox, *W. C.* 13923 and 14341. Specimens of birds' skins from Tennessee and New York.

Frank, *A.* (*Stassfurth*, *Germany*). 14405. Six boxes collection of salts and dumy flue from Germany.

Franklin County. 15303 and 15318. Specimens of muscovite and asbestos from North Carolina.

French, *Hon. H. F.* 14586 and 14591. Specimen of dried interior of a sea cucumber, and istle grass used in making baskets, brushes, &c.

Frick Coke Company, *H. C.* 15187 and 15273. Box and barrel, specimens of coal, coke, &c., from Pennsylvania.

Fritzsche Brothers. 13936. Box containing specimens of drugs and essential oils.

Frye and De Graff. 15472. Specimens of zinc ores from Missouri.

Fuller, *O. P.* 15322. Specimens of minerals from Jefferson County, New York.

Fuller, *William.* 14214. Skeletons of raccoons, weasel, muskrats, and minks, from New York.

Furlong, *John.* 14506. Sample of silver ore from Colorado.

Gaddis, *H. M.* 14121. Specimen of arrow-head from Ohio.

Galbraith, *Frank G.* 14624. Alcoholic specimens of fish from Pennsylvania.

Gale, *Dennis.* 14700. Seventeen specimens of birds' skins from Colorado.

Gallaher, *Miss L. Bernie.* 14320. Photograph of General Paez in uniform.

Gallagher, *W. H.* (*through R. B. Mercer*). 14647. Specimen of stone pipe from Virginia. (Loan.)

Gannaway, *W. R.* 15164. Specimen of ore from Arkansas.

Gaumer, *George F.* 14928. Specimens of birds' skins from Yucatan.

Gautier, *C. P.* 14520 and 14602. Specimens of clay and selenite from Louisiana.

Gazzam, J. P. 15066, 15209, 15210, and 15213. Specimens of silver, lead, and zinc ores, from Kansas and Missouri.

Gedney, A. G. 14547. Specimen of Bavarian lithographic limestone.

Geoghegan, N. O. 13956. Small specimens of native lithographic stones from Clay and Overton Counties, Tennessee.

Gerhard, Frederick. 14307. Cast of the death-mask of General George Washington. (Loan.)

Germania Smelting and Refining Company. 15182. Specimens of silver and lead ores, bullion, &c., from Utah.

Gesner, G. W. 14245. Specimens of ores from New York.

Gesswein, F. W. 15535. Samples of leather, &c., showing uses.

Gherman, Theodore. 14983. Specimens of marcasite from Mine La Motte, Mo.

Gibbons & Co., James. 14390. Living specimens of snapping turtle from Cleveland, Ohio.

Gilbert, B. F. 15047. Specimen of snake from Brightwood, D. C.

Gilbert, Charles H. 14525 and 15056. Alcoholic fishes from Indiana and Alabama.

Gill, Dr. T. N. 14400. Fourteen specimens of fresh fish (*Boleosoma olmstedi*) from Potomac River.

Glendale Zinc Works. 14888. Six boxes of zinc exhibits from mines in Missouri.

Godby, Thos. K. 14694. Alcoholic specimen of reptile from Florida.

Goetz, George W. 14048. Specimen of ore from Bear Gulch, Dakota.

Goff, jr., Hon. Nathan. 14205, 14605, and 15103. Specimens of rocks, ores, and minerals, from West Virginia.

Goldsborough, Henry H. 15448. Seventy-four samples of Australian wool.

Goode, Francis C. 13946. Indian vase from small mound east side of Saint John's River, 7 miles below Jacksonville, Fla.

Goode, G. Brown. 14404, 14443, 15175, 15176, and 15276. Nine pairs of wooden shoes, clogs, and gloves, from England and Belgium; specimen of ornamented cup made from shell; two specimens of shoehorns, and collection of campaign medals, &c.

Goodrich, J. King. 14178. Specimen of chalcovite and malachite in quartz from North Carolina.

Goodwin, A. P. (*through D. S. Spaulding*). 14562. Box and package containing collection of spears, bows, arrows, stone axes, stone clubs, tomahawks, pair fine shields, &c., from New Guinea. (Purchased.)

Goodwin, E. P. 15375. Piece of keel of fishing schooner.

Gould, J. Loomis. 14757 and 14917. Bale and box, specimens of bows, arrows, mats, canoe paddles, blanket, gambling sticks, seal spear, hook, carved duck, canoe hat, club, skull, &c., from Alaska; also 3 specimens of silver bracelets made by the Hydah Indians. (Purchased.)

Gouldsburg & Son, R. 14964. Specimen of marble from New York.

Government of Guatemala (*through Foreign Exhibition, Boston, Mass.*). 14138. Collection of materia medica, foods, stones, minerals, &c.

Government of Hawaii (*through Foreign Exhibition, Boston, Mass.*). 14113 and 14126. Collection of foods, textile fabrics, soils, materia medica, cube of building stone, &c., from Hawaii.

Government of San Salvador (*through Foreign Exhibition, Boston, Mass.*). 14112 and 14373. Large collection of foods, tobacco, cigars, cotton, wax, soap, candles, rope, palm-leaf mats, hats, &c.; also collection of materia medica, and fifty specimens of gold, silver, and iron ores.

Government of Venezuela (*through Foreign Exhibition, Boston, Mass.*). 14414. Large collection of foods, fibers, tobacco, seeds, drugs, oils, minerals, ores, &c.

Granby Mining and Smelting Company. 15219, 15253, and 15287. Nine boxes specimens of zinc ores and spelter, from Missouri and Kansas.

Graupner, R. F. 14642. Specimens of slate from Kansas.

Grebritzoki, Governor (*of Bering Island*). 15488. Three boxes of birds' skins from Bering Island.

Green, F. C. 15512. Eighteen specimens of arrow-heads from Wisconsin.

Greenwood, Walter J. 14168. Nine specimens of trout from Doublin, N. H.

Griffin, L. J. 15441. Slab of stalagmite marble from California.

Griffin, Miss M. E. 14895. Specimens of mica from Amelia County, Virginia.

Griffin, N. L. 15163. Two specimens of minerals from Texas.

Grigsby, C. S. 13919. Box of stone relics from Tennessee. (Purchased.)

Grinnan, Daniel. 14635. Specimen of tooth of horse from Mississippi.

Grosjean, Henry. 14056. Samples of French paper money of the period of the revolution.

Grittinger, Mr. (*through H. S. Fleming*). 14773. Specimens of iron ores, pig iron, &c., from Pennsylvania.

Gumbinger, J. 15334. Specimen of pipe made of bone from Florida.

Günther, Dr. A. (*British Museum*). 14798. Two casts of heads of dolphins.

Gunther's Sons, C. G. 15120. Box of mammal skins, and mounted group of deer and black wolf.

Hackenberg, Dr. G. P. 14794. Specimen of bulb from Texas.

Hains, Peter C., Major of Engineers, U. S. A. 14596. Specimen of rock from Potomac River at Georgetown, D. C.

Hale, Dr. J. P. 15087 and 15102. 3 boxes of "Peerless" coal from West Virginia.

Halifax County, North Carolina. 15316 and 15422. Specimen of marl and block of granite form North Carolina.

Hall and Co., Charles E. 15009. Two specimens of California and one of Mexican onyx.

Hall, C. J. 14651. Specimen of building stone from Mount Desert, Me.

Hall, James. 14271. Box of fossils and plants. (Collected by Frémont and Stansbury.)

Hall, L. R. 15329. Specimens of minerals from Jefferson County, New York.

Halstead, Miss May. 14352. Specimens of barnacle, and mollusk from Mississippi.

Halverson, Alexander. 15433. Specimens of ores from New Mexico.

Halverson, C. 15070. Specimen of galena, and lead ore from New Mexico.

Hamilton, B. A. 15072. Specimen of mineral from Nevada.

Hamilton, B. H. 15267. Specimen of mineral from California.

Hammack & Co., A. 15170. Samples of shagreen from shark's skin imported from France. (Purchased.)

Hammontree, S. 14655. Specimen of fossil wood from Arkansas.

Hamy, Dr. E. (*Trocadero Museum, Paris, France*). 14193. Sample of mold from Palenque, Mexico.

Handy, B. R. 14397. Specimen, branch from tree.

Hanifen & Co., John E. 15124. Specimens of knit goods.

Hardy, Manly. 14077. Skeleton of red fox from Maine.

Harford, Prof. W. G. W. 15300. Specimens of sea lion's bristles.

Harlow, Ensign C. H., U. S. N. 14778 and 14792. Alcoholic specimens of cod and sculpin from Disco Bay, and skin of Eskimo dog from the Greely Relief Expedition.

Harper, Jefferson. 14189. Specimens of minerals from Kansas.

Harrell, J. Dock. 14606. Alcoholic specimen of salmon from Mississippi.

Harrison, Benjamin. 13918. Specimen of large mastodon tooth from shores of Lake George, Florida.

Harrison, Brothers & Co. 15205. Five boxes, containing samples illustrating the manufacture of white lead.

Harris, Gwynn. 14631. Specimen of fresh fish from Norfolk, Va.

Harris, W. C. 14938. Specimen of fresh fish from Gogsbic Lake, Mississippi.

Harris Woolen Company. 15414. Samples of woolen goods.

Hart and von Arx. 15199. Specimens illustrating the process of lithographing on stone.

Hartig, J. E. (*British Museum*). 14033. Collection of birds' skins from various localities.

Hassler and Hopkins. 14621. Specimen of ore from West Virginia.

Hawkins, John. 14442. Specimens of arrow-heads, pottery, shells, &c., from South Carolina.

Hawkins, Joshua. 14804. Specimen of fish from South River, Maryland.

Hawley, E. H. 14440 and 14590. Fresh specimen of Japanese fish and 6 specimens of pottery, from Foreign Exhibition, Boston, Mass.

Hawley, J. K. 15408. Specimens of minerals from North Carolina and Virginia.

Hayden, Charles S. 13971. Specimen of clam shell from Maine.

Hayden, John C. 15465. Specimens of serpentine from California.

Haydon, F. Walton. 14306. Alcoholic specimens of birds, fishes, reptiles, and shells, from Hudson Bay Territory.

Hayward, Nat. 13986. Specimen of bird in flesh from Maryland.

Hazlewood, F. F. 14232. Specimen of snake from Maine.

Healy, Captain M. A., U. S. R. M. 15278, 15356 and 15382. Six boxes of birds, fishes, dredgings, rocks, skin of owl, and crania; also specimens of plants from Alaska.

Heape, C. 14014. Ethnographic specimens from England.

Hemphill, Henry. 13910, 14005, 14140, 14316, 14457, 14474 and 15519. Large collection of alcoholic and dried specimens of invertebrates, corals, shells, &c. from Florida.

Hempstead, Elias. 14303 and 14312. Collection of fossil bones from Florida.

Henshaw, H. W. 13938, 13961, 14212, 14263, 14409, 14716, 15484. Collection of birds' skins, nests, two skins of California vulture, and specimen of snake, from Massachusetts, Virginia, Nevada, California, New Mexico, and District of Columbia.

Heppingstone, Miss Adeline. 14001. Specimens of Arctic plants, pressed and mounted.

Herbarium of Harvard University. 14392 and 14489. Six large packages of botanical specimens.

Hereford, Hon. Frank. 13974. Specimen of rock from West Virginia.

Hering, C. J. 14150. Collection of alcoholic birds, reptiles, insects, shells, &c., from Surinam.

Herndon, W. S. 13935. Specimens of coal from Texas.

Herring, Sons & Co., O. 14674. Samples of carpets, showing process of manufacture by hand looms.

Hicks, G. H. 14718. Alcoholic specimen of snake from Michigan.

Higgins and Gifford. 15358 and 15435. Boat model from Massachusetts, and model of Jamaica fruit boat.

Hinckley, Isaac. 15352. Specimen of duck in flesh from Virginia.

Hitchcock, Romyn. 13975, 14786, and 14973. Twelve specimens of the different furs of commerce; 8 samples of teas, and Germania coffee; samples of textiles from Massachusetts, and two Plucker tubes.

Hitchcock, Mrs. R. 14638. Samples of laces.

Hodge, R. S. 14686. Specimens of minerals from New York.

Hodgson, Thomas. 14854. Two photographs of the Pennsylvania Coal Company's docks, &c.

Holabird, Q. M. Gen. S. B., U. S. A. 14682, 14812, 14984, and 15282. Snare drum, complete with sling and sticks, trumpet and cord, fife, 6 models of tents with equipments, and buffalo and horse hair plumes as used and worn by officers and men of U. S. Army. (Deposited.)

Holmes, Frank. 14135. Sample of folding canvas boat.

Holmes, John F. 14038. Specimen of water bird from Massachusetts.

Holmes, W. H. 15298. Specimen of wampum belt from Mohawk Indians.

Holtzlander, B. 14567. Specimen of a domestic cat from Washington, D. C., in flesh.

Hoosier Stone Company. 14867. Specimen of building stone from Indiana.

Hord, J. T. 13978 and 14526. Specimens of minerals from Arizona.

Horn, & Brothers, William H. 15372. Four boxes of shoemakers', tanners', and curriers' tools.

Horn, Dr. G. H. 14004. Box of minerals, fossils, and alcoholic insects from Arkansas.

Hornaday, W. T. 14822. Thirty-seven specimens of birds' skins from India.

H ner and Hyde. 14399. Two cans of net-preservative fluid.

Horn Silver Mining and Smelting Company. 15181. Specimens of silver, lead ores and products from Utah.

Hough, F. B. 14377. Sample of maple syrup from Lowville, N. Y.

Houghton, F. W. 15440. Seven specimens of lava and ashes from volcanic eruption in the Straits of Sunda.

Hovey, F. S. 14138. Specimen of tooth of horse from Washington Territory.

Howard, Arthur G. 14364. Specimens of minerals from Massachusetts.

Howard, Ernest. 14601 and 14739. Specimen of malachite with hematite, and copper ore from Virginia.

Herrman, H. 15466. Samples of plush as used in trade.

Hudson, George A. 14280. Specimens of fresh fish from Ogeechee River, Georgia.

Humphrey Brothers & Tracy. 14850. Specimens of miners' boots, brogans, &c.

Hunt, Capt. T. B. 14153. Fresh specimen of the mountain sheep, from Fort Bridger, Utah.

Hunter, Captain (through L. Stejneger). 15487. Two specimens of mountain sheep and box of birds' skins from Kamtschatka.

Huse, Fred. J. 14470. Specimens of birds' skins from California.

Huske, C. J. 13944. Specimen of salted fish from South Carolina.

Hussey & Co., C. G. 15085 and 15106. Specimens of coal and copper from Pennsylvania.

Iglesias, Rafael. 14989. Box of Indian antiquities and pottery from Costa Rica.

India Museum (through Prof. J. Wood Mason). 15057. Box alcoholic shells of *Tarbinella pyrum* from Calcutta, India.

Ingalls, John. 14085. Specimen of coral imbedded in bone, from Georgia.

Iowa College. 14579. Package of photographs of the Iowa College Museum, Iowa.

Jacobs Brothers. 14215. Specimen of St. Bernard dog in flesh.

Jacobs, George A. 14809. Box of stone relics from South Carolina.

James, Joseph C. 15093. Carved granite head, and stone ball. (Loaned.)

Jansen, D. C. 14644. Specimen of brick from ruins of the Porcelain Tower at Nanking, China; fossils from gorges of Upper Yangtse, and slates from China.

Jefferson Iron Company (Antwerp, N. Y.). 14685. Two boxes of minerals.

Jeffreys, J. Gwyn (London, England). 14241. Large collection of European and other shells. (Purchased.)

Jenks, Fred. T. 15001. Specimen of Impeyan pheasant.

Jenks, J. W. P. 14765. Specimens of turtles from various localities.

Jennings & Sons, A. G. 14034. Specimens illustrating the process of manufacture of silk lace.

Jeremiah, William H. 15261. Three specimens of mounted birds.

Jewett, George W. 14174 and 14252. Specimens of materia medica.

Johns Manufacturing Company, H. W. 15339. Specimens of asbestos.

Johnson, Dr. E. B. 14410. Specimen of pipe and two stone relics from Alabama. (Loaned.)

Johnson, Gallup & Hurry. 14823 and 15123. Samples of coal from Hay Creek mines, Wyoming.

Johnson, J. E. 14545. Photograph of the Longdale furnace, Longdale, Va.

Johnson, J. W. 15505. Specimens of birds' skins from Alaska.

Johnson, Lawrence. 14454. Small fossil from Florida.

Johnson, Prof. L. C. 14444. Two specimens of fulgurite collected by Silas Stearns at Santa Rosa Island.

Johnson, Dr. P. E. 14698. Five specimens of minerals from Jefferson County, New York.

Johnston, Col. Alexander. 15351. Pair of Japanese shoes and stockings.

Johnston, E. B. 14198. Specimen of coke from Alabama.

Johnston, G. W. 15113. Specimen of cassowary in flesh.

Jones, James T. 15436. Specimen of meadow lark with straw through back (in flesh).

Jones, Simpson & Co. 14558. Three photographs of glacial pot hole from Archbald, Penn.

Jones, Strachan. 14609. Specimen of bone from California.

Jones, Dr. William H., U. S. N. 14202, 15224, and 15474. Eleven boxes, 2 kegs, skulls, birds' skins, alcoholic specimens of fishes, invertebrates, &c., from Honolulu; also large collection of pottery, shells, invertebrates, Indian relics, birds, reptiles, &c., from Ecuador, Peru, and Galapagos.

Joplin Zinc Works. 15110. Specimens of zinc from Missouri.

Jordan, Prof. D. S. 13981, 14376, 14486, 14828, 14881, 14944, 15002, and 15011. Large collection of alcoholic fishes and tortoise from Missouri, Iowa, Arkansas, Indiana, Texas, Florida, Cuba, and Venice, Italy.

Jordan, N. J. 14142. Specimen of crazy-weed, or loco plant, from Indian Territory.

Kaldenberg, F. J. 15158, 15275, 15385, and 15453. Skull and horns of Indian stag, pair of Indian stag horns, and articles manufactured from horn; also collection of amber.

Kales, J. W. (M. D.). 14387. Indian skull and bones from Union Springs, N. Y.

Kansas City Silver and Refining Company. 15086. Two boxes lead and silver ores.

Karns, S. D. 14237. Sample of mineral from Kansas.

Karmy, A. B. 14092. Specimen of "Naigha," or Davids pipes, from Palestine.

Karr, W. W. 14330. Specimens of minerals for report.

Kaucher, William. 14678. Specimens of fossils from Missouri.

Keenan, Charles, Hospital Steward, U. S. A. 14779. Specimen of humming moth from Nevada.

Kelleher, Daniel. 14058. Specimen of eel 65 inches in length, stuffed; also cockroach-trap made from piece of wood from steamer Columbus, with box of cockroaches taken on board whale ship.

Kemp, J. F. 15104 and 15178. Photographs of the Desloges and Saint Joe Works from Missouri.

Kennedy, H. H. 14712. Specimens of minerals from Kansas.

Kesler, C. W. 15254 and 15503. Specimens of Indian relics from North Carolina.

Keifer, George. 14878 and 14978. Large collection of ethnography, mammals, shells, reptiles, minerals, &c., from Peru.

King, Mrs. S. E. 14274. Specimen of carved stone head. (Loaned.)

King, Samuel L. 14123. Specimens of minerals from Tennessee.

Kitt, A. 15430. Specimens of crystals found in fossils from Ohio.

Kleeberger, George R. 14436. Vertebral column of reptile from the Sierras, in California.

Knapp, E. B. 14302 and 14347. Collection of rocks, concretions, and fossil shells from New York.

Knapp, G. S. 14450. Piece of skin taken from back of Indian Chief "Gutnose," leader in "New Ulm massacre" of 1862.

Knowles, Hubert M., U. S. Life-Saving Service. 13940. Specimens of small marine animals and shell-fish from Point Judith Light, Rhode Island.

Knowlton, F. H. 15468. Three specimens of the bronzed grackle.

Knowlton, W. J. 14715 and 14791. Specimens of minerals from Massachusetts; also small collection of minerals. (Purchased.)

Koebele, Albert. 14897. Sixteen specimens of birds' skins from South America.

Kohler, Anton. 14036. Specimen of rock from Wisconsin.

Kohn, A. H. 14429. Specimens of ores, minerals, and arrow-head from South Carolina.

Kohn, G. 14327. Living specimen of turtle from Louisiana.

Koons, B. F. 14458. Specimen of Indian mortar from Connecticut.

Krantz, Dr. A. 15025. Specimens of wooden crystals. (Purchased.)

Kummerfeld, J. F. 13973, 14282, 14652, and 15444. Specimens of Indian relics from Iowa.

Kunkel, J. 15427. Specimen of ore from Maryland.

Kunz, G. F. 14747. Two boxes of minerals from various localities.

Lacoc, R. D. 14852. Box of Rhode Island anthracite coal.

Laflin & Co. 14367. Specimens of whitefish from Lake Michigan.

Lake, Miss Frankie. 14002. Living specimen of white rat.

Lake Superior Native Copper Company. 14827. Box of copper slag, &c., from Michigan.

Lamson & Brother, John S. 14016. Photographs of stone carving and package of bones from Chiriqui, Mexico.

Lanfair, George R. 13912. Specimens of starfish eggs.

Lange, Fr. W. A. 14379. Specimens of the wood and bark of the "Hombre grande," or bitter-wood, from Nicaragua.

Lanyon, Robert. 15286. Seven boxes and two pieces of zinc ores and spelter from Kansas.

Larco, A. 14472. Box of alcoholic fishes from California.

Lartigue, Dr. G. B. 14071 and 15507. Live specimen of glass-snake (*Ophcosaurus ventralis*), stone relic, and clay from South Carolina.

Lavack, Fred. 15319. Specimens of minerals from New York.

Lawlor, D. J. 15228 and 15262. Sixteen boxes and crate of boat models.

Lawrence, B. and P. 15171. Specimens of pen-holders made from porcupine quills. (Purchased.)

Lawton, H. J. 14637. Specimen of mineral from Washington Territory.

Lay, jr., H. C. 14298. Specimens of insects and mould from Colorado.

Lea, Dr. Isaac. 14466. Life-size crayon portrait of Dr. Isaac Lea.

Leech, Daniel. 14966. Specimen of vertebræ of whale from Massachusetts.

Lee, John W. 15397. Specimens of minerals from Maryland.

Lefils, G. 14154. Stone relic from Belgium.

Lehnert, Rev. E. (through R. E. C. Stearns). 14595. One hundred and thirty-three species and varieties of land and fresh-water shells from the District of Columbia.

Lemon, John H. 14639. Specimens of stone axes, arrow-heads, &c., from Indiana.

Leon, Dr. Nicholas. 14179. Photograph of image of an idol from Mount Tzirate, near Del Cristo, district of Morelia, Michoacan, Mexico.

Lewis, D. W. 15112. Specimen of hornet's nest from Crawford County, Pennsylvania.

Lexington Mining Company. 15214. Specimens of silver ores and products from Montana.

Lightfoot, M. P. 14957. Specimens of fossils from Kentucky.

Lilienberg, N. 15128. Specimens of pig and bar iron from Sweden.

Lincoln County, North Carolina. 15418. Specimens of magnetic iron and gold ore.

Lind, G. Dallas. 14972. Specimen of fossil coral from Indiana.

Lineberger, J. M. 14529. Specimens of minerals from North Carolina.

Lippincott & Co., Charles. 14673. Specimen of marble.

Lippitt Woolen Company. 15383. Samples of woolen fabrics.

Logan, Hon. John A. 14169. Specimens of copper and silver ore from Arizona.

Long J. C. 14305 and 14481. Three specimens of sulphur in limestone, and black jacobin pigeon in flesh, from Pennsylvania.

Longdale Iron Company. 14982 and 15204. Collection of mining lamps, and 11 boxes of pig iron, iron ores, &c., from West Virginia.

Longheed, S. D. 15018. Specimens of minerals from Washington Territory.

Long Elm Mining and Smelting Company. 15109. Specimens of lead ore, pig and white lead, from Missouri.

Longstreet, R. F. 14006. Specimen of hair seal.

Lovett, Edward (London, England). 14253. Alcoholic specimens of stalk-eyed crustacea of the English Channel.

Low & Co., C. Adolphe. 14993. Samples of raw silks.

Lowell Carpet Company. 15099. Eleven samples of carpets.

Luchs, L. 13962, 14163, and 14203. Sample of sand for examination for manufacture of glass from Western Pennsylvania; sample of water and washed sand, also specimens of glassware made from sand 2 miles from Washington, D. C.

Lupton, N. T. 14299. Specimen of stone carving from Alabama, and piece of pottery from Chihuahua, Mexico.

Luther, R. C., Mining Engineer of the Philadelphia and Reading Coal and Iron Company. 15390. Large specimen of lump coal from Pennsylvania.

Lutken, Chr. 14500. Cast of the cranium of dodo, in the possession of the Zoological Museum of the University of Copenhagen, Denmark.

Maas & Co., William. 15264. Specimens illustrating the manufacture of combs, &c., from horn.

McFarlane, R. 14072. Skin of marten and musquash from Chipewyan, Hudson Bay Territory.

Macgregor, Miss Inez. 15038. Two specimens of hybrid fowls from Virginia.

Mackellar, Smiths & Jordan. 15095. Box of type metal, &c.

Mackinnon, Louis. 15469. Samples of fibers from Jamaica.

Mackintosh, J. B. 14903, 15177, and 15387. Photographs and negatives of the spiegel furnace and the Passaic Zinc Works. (Purchased.)

MacLean, J. P. 14293. Specimen of brick from wall of fort at Foster's Crossing, Warren County, Ohio.

Magruder, Dr. G. L. 15297. Specimen of parrot, in flesh.

Mansfield, J. F. 15398. Coal drill (Grim's patent).

Marcou, J. B. 14098 and 15409. Part of skin of *Litholepis spatula* from Texas, and specimen of vivianite in red sandstone from New Jersey.

Marquis, Dr. W. V. 14807. Specimen of bone and tooth from Pennsylvania.

Marsh, Charles H. 14755. Specimen of cotton-tail rabbit from New Mexico.

Marshall, George. 14473 and 14477. Two specimens of birds' skins from Maryland.

Marshall, Henry. 14496. Specimen of mounted bird skin.

Marshall, Lieut. W. A., U. S. N. 13950 and 14107. Package containing ashes which fell on board the American bark W. H. Bisse at sea (Indian Ocean) shortly after the Java earthquake; also specimens of barnacles from bottom of British ship Earl Granville.

Mather, Fred. 14088, 14155, 15464, and 15517. Specimen of mouse with fungus and eggs of the tom-cod from Long Island.

Martin, Capt. S. I. 13945, 14357, 14417, 14550, 15536, and 14589. Specimens of corals, sponges, fresh fish, mackerel spawn, parasites and suckers from sword-fish, and bones taken from mouth of a cod from the fishing banks of Newfoundland.

Mason, John S. 14239. Specimens of elk and deer heads.

Mason, L. G. 14599 and 14962. Package specimen of ore and fossiliferous limestone from West Virginia.

Mason, Prof. O. T. 14603, 14622, 14627, and 14958. Alcoholic specimens of fishes; bound volume specimen book of Bruce's Type Foundry; cast of the deluge tablet, or Chaldean account of the deluge, in Assyrian cuneiform characters; also collection of seeds.

Massee, Frank A. 14629. Specimen of ore from Virginia.

Matte, Paul. 15360. Living paradise fishes from Germany.

Matthews, W. 15524. Ethnographic specimens from Navajo Indians, New Mexico.

Maybery, R. 15071. Specimen of copper ore from New Mexico.

Maynard & Co., C. J. 14861. Specimens of birds' skins.

Maynard, G. W. 15295. Specimen of tin ore from Black Hills. (Loaned.)

McCallum, Dr. D. 14787. Head of bat from Mississippi.

McCarthy, John T. 14658 and 15480. Specimens of crabs and bones taken from the head of drum-fish; also specimens of ear bones of fish.

McCeney, Henry C. 14064. Fossil shells from Prince George's County, Maryland.

McClain, C. S., Ensign U. S. N., U. S. S. Alert. 14766. Five boxes, specimens of alcoholic fishes, birds, skeleton of fox, and skull of polar bear, from various localities in Greenland.

McClelen, S. E. 14337. Three specimens of minerals from Alabama.

McCook, Anson G. 14349. Silk flag which was presented to the U. S. Senate July 12, 1870, by Joseph Neumann, of California, supposed to be the first American flag made from American silk.

McCormick, Lewis M. 14484 and 14578. Specimens of rabbits in flesh, and birds' skins from Virginia.

McDonald, Angus. 14582. Specimen of marble from Clarke County, Virginia.

McDonald, Marshall. 14238. Specimen of eagle in flesh from Virginia.

McDonald, William. 14272. Specimen of coal from Texas.

McDougall, Alexander. 15494. Package of sediment from snow which fell during a snow storm at Poverty Gulch, Colorado, September, 1884, an elevation of 12,000 feet.

McDougall, J. & O. 14851. Specimens of assorted mining lamps. (Purchased.)

McEachem, Capt. Henry. 13994. Specimen of knife taken from stomach of codfish on Le Havre Bank.

McFarland, Prof. R. W. 14000. Specimen of root of cedar cut from stump 3 miles southeast of Oxford, Butler County, Ohio, 28 feet below surface.

McGee, W J. 14659. Four specimens of silicified wood.

McGuire, J. D., U. S. N. 13941 and 14222. Specimens of pottery, stone mortar, flint and bone implements, and fossils from Pope's Creek, Maryland; also skin of bird.

McIntosh, John A. 15014. Specimens of Florida rocks.

McKean, G. L. 14581. Profile portrait of George Washington. (Deposited.)

McKesson & Robbins. 15249 and 15347. Collection of sponges, and picture illustrating the preparation of sponges for commerce.

McKinley, C. 14408, 14425, and 14587. Specimen of fossil wood, arrowheads, shells, lump coal, rocks, and limestone from Alabama.

McLean, D. 14078. Specimen of short squid from Lower Potomac River.

McLean, John J. 13964, 14026, and 15504. Specimens of fossil shells from tunnel under Table Bluff, California; 12 boxes specimens of ethnography, stone relics, bones, &c., from California.

McLeod, Rev. R. R. 14879. Specimens of birds' skins from Mexico.

McManus, F. R. 14566. Two gray squirrels from New York.

McMenamin, James. 14464. Fresh specimen of hake (*Phycis regius*) from Hampton, Va.

McNiel, J. A. (*through John S. Lamson & Bro.*). 14796. Three casks, specimens of Chiriqui pottery, &c. (Purchased.)

McNulty, Alexis. 14008. Specimen of salted fish from Savannah, Ga.

McTeer, James P. 14386. Specimen of double-headed pig in flesh.

Meigs, General M. C., U. S. A. 13943, 14981, 15232, and 15470. Twelve specimens of ornamental terra cotta used in constructing the new United States Pension building; also dressed and ornamental woods from Pacific coast, Texas, and Ireland.

Mindeleff, Victor. 15450. Number of silver specimens made by the Navajo Indians of New Mexico.

Mendelson, Dr. Walter. 14630. Specimen of insect from Long Island, New York.

Mercer, R. W. 13928 and 13957. Specimens of flint, and stone implements from West Virginia and Georgia.

Merchant & Co. 14884. Two boxes, specimens of zinc, tin, &c.

Merchant, jr., G. 14990. Specimen of kyak with equipments. (Purchased.)

Merriam, Dr. C. Hart. 14428, 14593, and 14656. Six entire sets of mystacial bristles of hooded seal and one imperfect hood in alcohol, skins and skeletons of seals from Gulf of Saint Lawrence, and birds' eggs from New York.

Merrill, George P. 14662, 14703, 14710, 14763, 14788, 14801, 14811, 14818, 14947, 14994, 15117, and 15301. Photographs, drawings, and phototypes of different styles of architecture, by Theophilus Chandler, (architect), and collection of rocks, minerals, and prochlorite from Maine, Massachusetts, Maryland, and New Jersey.

Merrill, Dr. J. C., U. S. A. 14259 and 14657. Six boxes of birds' skins and eggs from the Western States, Texas, and Montana.

Merrimac Chemical Company. 15184. Specimens illustrating the manufacture of sulphuric acid.

Meyer, A. B. (Zoological Museum, Dresden, Germany). 14141. Case of Meissen pottery.

Miles Company, George W. 14122. Collection of oils, and fertilizers exhibited at London, England, 1883.

Military Institute (Lexington, Va.). 14309. Two specimens of fossils from Virginia.

Miller, Capt. George H. 14368. Specimen of rose-breasted grosbeak from District of Columbia.

Miller, Metcalf & Parkin. 14862 and 15101. Specimens of iron and steel, with case, from Pennsylvania.

Miltimore, A. E., Captain and Assistant Quartermaster, U. S. A. 14557. Specimen of a moth from Missouri.

Mine La Motte. 15340. Specimens of nickel and lead ore from Missouri.

Missouri Furnace Company. 15417. Specimens of iron ores, &c., from Missouri.

Mitchell, J. E. 14932. Four boxes, samples of grindstones.

Moloney, Capt. Alfred (England). 14035. Specimen of dugout used by the natives of the west coast of Africa.

Montana Smelting Company. 15533. Specimens of copper ores and products from Butte, Mont.

Moon and Lamphear. 14152. Fresh specimen of salmon from Oregon.

Moore, Degraffe & Co. 15473. Specimens of zinc ores from Missouri.

Moores, I. R. 13930. Alcoholic specimens of whitefish eggs from Oregon.

Moore, Julian A. 14213. Bird in flesh, from Virginia.

Moorhead, Warren K. 13979. Specimen of stone relic from Ohio.

Moran, Peter. 14054. Five framed plates illustrating the process of American etching.

Moreno, Theodore. 14216. Specimen of corundum in margerite from Georgia.

Morgan, Hon. John T. 15538. Four samples of crude petroleum from California.

Morris, D. (Director Public Gardens and Plantations, Jamaica). 13903, 14236, and 15461. Collection of materia medica and fungus from Jamaica.

Morris, Dr. Robert T. 14435. Specimens of Filaria taken from air bladder of trout from Connecticut River.

Morrison, Plummer & Co. 14251. Sample of earth from Nevada.

Morrison, Z. P. 13929. Specimen of stone pipe (broken) from Alabama.

Morton, J. Sterling. 14228. Specimen of Moorish stirrup. (Deposited.)

Moseley, H. N. (Oxford University, England). 14502 and 15518. Specimen of carnivorous plant with a number of newly-hatched fish attached; also two microscopic slides.

Mossy Creek Zinc Mine. 15271. Specimens of zinc ores from Tennessee.

Moulton Mining and Smelting Company. 15376 and 15534. Specimens of silver ores, and products from Moulton mine and mill, Butte, Mont.

Motz, Emanuel. 15186. Three boxes minerals and ores from South Carolina.

Mound City Paint and Color Company. 15105. Specimens of mineral paints from Missouri.

Muckle, A. M. 14230. Specimen of fresh fish from Manitoba.

Murdoch, John. 15407. Specimen of black amber from Alaska.

Musson, E. L. 14254. Specimen of mineral from Colorado.

Muzzey, A. P. 14183. Sample of building stone and rock from Wisconsin.

Nation, William. 14133, 14411, and 15486. Collection of birds' skins from Peru.

Nattalburg Coal and Coke Company. 15389. Samples of coke from West Virginia.

Natural Coal and Coke Company. 15218. Specimens of coal and coke from Virginia.

Neal, Dr. J. C. 14129 and 14776. Two boxes of fossil bones from Florida.

Neill, J. W. 15051. Collection of minerals from Missouri.

Nelson, E. W. 14323, 14461, 14531, 14653, 14753, 14890, and 15516. Fifteen boxes, 2 barrels, specimens of birds' skins, reptiles, mammals, pottery, stone implements, ethnographic, &c., from Arizona and California.

New Hanover County. 15419. Phosphatic rock from New Hanover County, North Carolina.

New River Coal and Coke Company. 15200. Sample of coal from West Virginia.

Newton, Prof. H. A. 15250. Specimen of the Burlington meteorite. (Loaned.)

Newton, Dr. W. S. 15429. Tracings of footprints (on muslin) found in sand rocks in Indian Territory.

New York Assay Office. 15403. Bottle of iridosmine residue. (Loan.)

Nicholls, Dr. H. A. Alfred. 13951. Birds' skins, shells, and native sulphur from Dominica, W. I.

Nichols, G. Lawrence. 14741 and 14770. Twenty-three specimens of birds' skins and 3 perches from New Jersey.

Nichols, Capt. James H. 14315, 14492, and 14612. Collection of Indian relics and stone carvings from Georgia; also 2 specimens of Indian pottery. (Loaned.)

Nims, C. D. 14713. Collection of minerals. (Purchased.)

Nippon Mercantile Company. 15246. Whalebone cigarette case, and turtle-shell toilet box. (Purchase, New Orleans Exhibition.)

Nissley, J. R. 14285 and 15442. Specimen of cupped stone from Ohio; also specimens of stone relics. (Loan.)

Norman, Dr. A. M. 14039. Alcoholic invertebrates from England and Scotland.

North Chicago Rolling Mill Company. 14911, 14931, and 15363. Specimens of steel ingot, and 8 boxes of iron, steel, slag, &c., and photograph of mills.

Northern Chief Mine. 15237. Specimen of ores from Utah.

Norton, C. B. 14513. Barrel of Brazilian pottery from Boston Foreign Exhibition.

Norton, O. W. 14106. Specimen of mineral from New York.

Norway Mining and Manufacturing Company. 15111. Specimens of ores from Utah.

Nova Scotia Iron Company. 15252. Specimens of iron ores, pig iron, &c., from Missouri.

Oglesby, Dr. W. W. 14304. Indian stone relic from Oregon. (Deposited.)

Omally, Michael T. 14204. Specimen of worm from Arkansas.

Oman and Stewart Stone Company. 14276. Six specimens of building stones from Kentucky.

Ontario Silver Mining Company. 15235 and 15236. Four boxes of ores and products from Utah.

Orcutt, C. R. 14090, 14224, 14530, 14536, 14838, 15030, and 15392. Specimens of birds' skins, living and alcoholic reptiles, shrimps, insects, barnacles, minerals, fossils, shells, and specimen of wood perforated by *Limnoria californica*, from California.

Osborn, Dr. T. C. 14806. Specimens of birds in flesh from Texas.

Osceola Mining Company. 14800, 14825, and 14826. Specimens of copper ores and its associates from Michigan.

Oxford Copper and Sulphur Company. 14445. Specimens of copper ore from Bergenport, N. J.

Pacific Mills. 15032 and 15229. Specimens illustrating the manufacture of woolen and cotton goods; also copper roller for printing calico.

Page, Booth & Co. 15471. Two boxes of coal tar and ammoniacal products.

Page, George Shepard. 14388. Stuffed skin of salmon.

Page and Krausse. 15088. Metallic and mineral paints from Missouri.

Paint Creek Mining Company. 14817. Specimens of coal from West Virginia.

Palmer, Dr. Edward. 14145, 14289, 14462, 14943, 14976, and 15028. Collection of ethnographic specimens, sedge grass, rice, pestles, musical instruments, wood pipes, &c., from Alabama and Georgia; also 65 boxes sponges, corals, invertebrates, ores, shells, materia medica, &c., from Florida.

Palmer, William. 13958, 13963, 14206, 14260, 14262, 14369, and 14577. Specimens of birds' skins from Virginia and South Carolina; also mounted specimen of parrot.

Park, John M. 14555. Photograph of stone carving.

Parker, Rev. C. W. 15150. Specimen of tooth from Georgia.

Parker, H. W. 14761. Specimen of triassic sandstone from Iowa.

Parker, W. Thornton, U. S. A. 15165. Specimen of Apache Indian bed from Fort Union, New Mexico.

Parkhurst, V. P. 14509. Samples of food, fruits, plants, &c., from Jamaica.

Parrot Smelting Company. 15530. Specimens of copper ores and products from Butte, Mont.

Parsons, William B. 15041. Sword of swordfish (curved); chart of Nova Scotia, New Brunswick, dated 1798; chart of Labrador coast (very old); and an old-style rule.

Passaic Zinc Company. 14690, 14998, and 15368. Collection of zinc ores, spiegel, &c., from their works.

Pattee & Weeks. 15059. Model of the ship Glasgow.

Pawtucket Hair Cloth Company. 15226. Specimens illustrating the manufacture of hair cloth.

Pearce, Richard. 14370. Specimens of minerals from Utah, Montana, and Colorado.

Peckham, S. F. 15000. Specimens of minerals from Minnesota.

Pelletier, Antonio. 15364. Specimen of stone relic from Mexico.

Pendleton, P. 15159. Specimen of building stones from West Virginia.

Pennsylvania Coal Company. 14723. Lithograph of the Barnum colliery breaker of Pennsylvania Coal Company.

Pennsylvania Diamond Drill Company. 15147, 15156, and 15207. Five boxes containing diamond-drill exhibit.

Pepper Mining Company. 15307. Specimen of magnetic iron ore from North Carolina.

Perigo, Elmer. 14469. Two specimens of red squirrel in flesh from Falls Church, Va.

Perkins, G. H., U. S. N., commanding U. S. S. Hartford. 14859. Box containing photographs taken by Lieutenant Vreeland and Dr. J. F. Bransford.

Perley, L. O. 14564 and 14680. Specimens of fossil shells from Kansas.

Perry, N. H. 13976, 14021, 14023, 14040, 14134, and 14742. Specimens of minerals from Maine.

Philadelphia and Reading Coal and Iron Company. 14921. Two boxes specimens of coal, and miners' tools, from Pennsylvania.

Phillips, Barnet. 15225. Glass balls with feathers.

Phipps, J. 15401. Specimen of ancient coin from Macedonia.

Photo-Engraving Company. 15277. Samples illustrating the process of photolithography.

Picket, T. J. 15149. Eight stone and one piece of pottery from Old Mexico. (Deposited.)

Pike, G. W. 14968. Specimen of earth from spring in Arizona.

Pilsbry, H. A. 14987. Specimen of shell from Iowa.

Piper, Mrs. M. A. 14699. Specimen of mora belt and miniature book made from gum.

Poey, Prof. Felippe. 14640. Package alcoholic specimens of fish from Cuba.

Poole, C. Clarence. 14426. Photograph of hail-stones which fell in Dubuque, Iowa, June 16, 1882.

Poole, George. 14012. Specimen of baboon in flesh.

Pope, Cole & Co. 15257. Specimens of copper metal and slag from Maryland.

Potter, Mrs. Frances McNeil. 14102. Sample of hair of the late President Franklin Pierce.

Powell, R. J. 15309 and 15423. Block of breccia, specimens of minerals, and one diamond-drill core from North Carolina.

Pratt and Lambert. 14242. Samples of spar and light hard oil finish.

Pratt, R. H., Capt., U. S. A. 14055. Max Spotted-tail, Sioux boy, 18 years old (son of Spotted-tail, chief). (Loaned for cast.)

Price, T. S. 15251. Specimen of insect from California.

Proctor, J. M. 14615. Two specimens of ores from Tennessee.

Proctor, John R. 15288. Fourteen boxes of building stones from Kentucky.

Pulcher, C. G. 14756. Specimen of meteorite.

Pumpelly, Raphael. 14082. Eighteen boxes specimens of iron ore.

Quail, James B. 14378. Specimens of fossils, rocks, and stone relic from Kansas.

Queen & Co., James W. 15369. Samples of American and foreign safety mining lamps.

Radford, William H. 15168. Specimens of amalgam, fine gold, nuggets with gold and gravel from California.

Ragsdale, G. H. 14104, 14743, and 15077. Birds' skin from Florida. Two boxes of birds' skins and mounted specimen of *Buteo harlani* from Texas. (Purchased.)

Ramsdell, J. F. 14188. Specimen of mineral from Minnesota.

Ramsey, N. A. 14913. Specimen of worm from North Carolina.

Randolph County, North Carolina. 15304 and 15420. Specimens of gold ore from Bush Hill and Leach mines, North Carolina.

Ransom, C. H. 14030. Plaster cast of stone relic from Erie County, Ohio.

Rathbun, Latham. 14132. Marine specimen from cell in piece of coral off Tampa Bay, Fla.

Reading Bolt and Nut Works. 15489 and 15496. Lithographic plan of their works, drawings of furnaces and tools in connection with rolling-mill works; also 5 boxes of specimens of bolts, rivets, nuts, &c.

Reckhart, D. W. 15220. Specimens of ore from Utah.

Red Ash Coal Company. 14767. Specimen of coal from Ross Vein mine, Pennsylvania.

Red Bird Mine. 15121. Box of ores from Utah.

Reeves, Paul S. 15206. Specimens of bronze and other alloys.

Reiche, Charles. 14079 and 14284. Two fresh specimens of monkeys.

Reiche, Edward. 14020, 14046, 14111, 14147, and 14490. Four specimens of monkeys in flesh, and one alligator about 10 feet long.

Remick, John A. 14719. Specimens of gems.

Restigouche Salmon Club. 14692 and 14726. Four large fresh specimens of salmon (*Salmo salar*) from Canada, and alcoholic specimens of young salmon.

Rey, Dr. E. 14899. Box of birds' skins from Germany.

Reynolds, B. 14934. Skeleton of porpoise from New Jersey.

Reynolds, Dr. E. R. 15137. Stone implement from District of Columbia.

Rheem, E. S. 15116. Two specimens of horse-hair snake (*Gordius aquaticus.*)

Richardson and McCormick. 14226. Two specimens each of flying and red squirrels from Virginia.

Richardson, J. 14172, 14402, and 15514. Specimen of jumping-mouse (*Zapus hudsonius*) from Virginia; also specimen of skeleton of python and rabbit skin.

Richmond and Potts. 15293. Drawings of Siemens furnaces.

Ridenour, C. E. 15259. Specimens of parasites taken from Potomac River herring.

Ridgway, A. W. 14887. Three specimens of small birds from Virginia.

Ridgway, D. 15227. Alcoholic specimens of reptiles from Indiana.

Ridgway, R. 14319, 14478, 14886, 14925, and 15223. Specimens of birds' skins from Virginia and District of Columbia; also two flint arrow-heads from Indiana; specimen of bat caught in Smithsonian building.

Riggs, E. Frank. 14424. Head-dress of Sioux chief. (Deposited.)

Ringwalt, Joseph C. 14505. Specimen of timber showing dry rot, from District of Columbia.

Rivett-Carnac, H. 14200. Specimen of the five-headed cobra, supported by the tortoise, silvered, from Benares bazaar, India.

Roane Iron Company. 14880. Box of iron ore from Tennessee.

Roberts, I. H. 14332. Specimen of ore from New Mexico.

Robertson, W. B. 14049. Specimens of minerals from Virginia.

Robeson County, North Carolina. 15308. Box of marl from North Carolina.

Robinson, F. C. 14910. Specimens of minerals from Maine.

Robinson, Mrs. J. M. 14551. Package of daisy flowers from Utah.

Robinson, T. 14702. Twenty-nine samples of sand, &c., from east shaft of Washington water-works extension.

Rock, Dr. Miles. 15050. Twenty-five dry-plate negatives of objects along the boundary line between Guatemala and Mexico.

Rockwell, A. F., Col. U. S. A. 14162. Specimen of hair from the head of the late President James A. Garfield.

Rockwood, E. J. 15291. Specimen of stone relic from Massachusetts. (Loaned.)

Rodgers, Mr. (through Capt. J. W. Collins). 15359. Specimen of model of the boat Oregon.

Rogan, James W. 14171, 14300, 14314, and 15283. Alcoholic specimens of mammals, birds' skins, and two birds in flesh from Tennessee.

Rogers, William J. 14199. Specimens of minerals from Missouri.

Romero, M. (Mexican legation). 15118. Ten packs of Mexican playing-cards.

Rose, R. E. 15452. Sample of earth from Florida.

Roseborough, J. B. 15458. Specimen of coddling-moth nest on twig from Utah.

Rosecrans, Hon. W. S. 14120. Specimens of minerals from New Mexico.

Ross, Dr. W. S. 14351. Specimen of parasite.

Rowland, J. H. 14362. Specimen of double-headed lamb (*Ovis aries*) in flesh from Maryland.

Roxbury Carpet Company. 14996. Seven specimens of tapestry Brussels carpets.

Royal Botanical Gardens (Kew, England). 14044. Box of valuable materia medica.

Royal College of Surgeons (London, England). 14096. Skeleton of *Globiocephalus melas* from Tasmania.

Ruby, Charles. 15506. Specimens of skeleton of elk complete, skin of black-tailed deer, buck head with antlers, and fossil shells.

Rudinee, L. 15073. Specimen of copper ore from New Mexico.

Rust, Horatio N. 14494. Three packages samples of dried cactus, fruit of fig, live-oak acorns, and meal made from the acorn of California.

Saint Genevieve Copper Company. 15129. Nine boxes specimens of copper ores, &c., from Missouri.

Saint Joe Lead Company. 14234, 14969, and 15008. Specimens of lead ore, associates, and minerals.

Saint Lawrence Marble Company. 14831. Large block of white marble from Gouverneur, N. Y.

Saint Louis Ore and Steel Company. 15138. Specimen pig-iron from Missouri.

Saint Louis Smelting and Refining Company. 15243. Specimens of silver and lead refining products.

Saint Louis Tripoli Company. 15089. One half barrel of tripoli from Missouri.

Sampson County, North Carolina. 15313. Fourteen specimens of phosphatic rock from North Carolina.

Sanders, J. D. 15053. Box of minerals from Missouri.

Sanford, G. 14689. Specimens of fibers.

Saunders, Howard. 15078. Five specimens of birds' skins from Greece, India, and South America.

Sauter, Frederick. 15058. Box of specimens of birds' and mammal skins from Asia and Africa.

Sawyer, C. M. 15449. Specimens of stone relics. (Loaned.)

Sawyer, R. J. 14781. Two specimens of teeth "horse" from Michigan.

Sayles, Ira. 13989. Specimens of chalcedony from Tennessee.

Sayre Female Institute. 14139. Box of fossils from Kentucky.

Schlichter Jute and Cordage Company. 15244 and 15335. Samples of jute, twine, rope, &c.; also samples of foreign jute.

Schluter, Wilhelm. 15045. Package of birds' skins from Siberia.

Schneider, Harry. 14227. Fresh specimen of Laverack setter.

Schreiber, J. D. 15353. Box of corundums from Pennsylvania.

Scott, Samuel. 14275 and 15482. Two packages of ores from Dakota.

Seal, William P. 14281. Living specimens of fishes from Pennsylvania.

Sells Brothers. 15490. Specimens of wart-hog and baboon in flesh.

Sells, Lewis. 14294. Fresh specimen of panther (*Felis concolor*), died in captivity at Johnson City, Tenn.

Semple, J. G. 14774, 14892, 15019, and 15402. Collection of drawings and charts. (Purchased.)

Seton, Ernest E. T. 14912. Specimens of ducks, worms, &c., from Cranberry, Manitoba.

Sewall & Co., Arthur. 15341. Model of boat Rappahannock.

Sexton, Daniel. 15483. Specimen of mineral from California.

Shaefer, P. W. 14901. Photograph and tracings of iron mines and columnar section of the coal measures near Kohinoor colliery, &c.

Shaffer, Dr. J. M. 14528 and 15034. Specimens of petroleum geodes and insects from Illinois and Iowa.

Sharp, jr., & Co., Richard. 14856. Three photographs of mine engines for outside and inside work.

Sharpe, R. Bowdler (British Museum). 14045, 14264, and 15439. Specimens of birds' skins, collected by Capt. C. T. Bingham; 66 specimens of birds' skins, chiefly India; also specimens of swallows from various localities.

Sharpless, A. 13915. Three specimens of stone relics from Pennsylvania.

Sheafer, P. W. 14877. Slipper made from anthracite coal; also cube of artificial coal, stigmaria, algæ, and calamite, from Pennsylvania.

Sheafer, Walter S. 14874. Specimen fossil plant from Kohinoor colliery, Pennsylvania.

Sheldon, D. S. 14432, 14769, and 14813. Living specimens of land tortoise, turtles, and turtle-shells from Iowa.

Shelton, Joseph. 14412, 15075, and 15185. Samples of ores, rocks, quartz, &c., from Virginia.

Shepard, Prof. Charles U. 14611. Slice of the iron meteorite from Dalton, Whitfield County, Georgia.

Shepard, James. 14047 and 15013. Cast of perforated stone ornament and photograph of bowlder.

Shields, G. O. 15381. Specimen of stone implement from Wisconsin.

Shindhelm, M. 15373. Specimens of human hair wigs.

Shipman, Miss Dot. 14790. Specimens of alcoholic fishes from Florida.

Shoemaker, D. L. 15371. Specimen of squirrel in flesh.

Shoemaker, W. L. 13942. Specimen of stone mortar from Maryland.

Shriver, Howard. 14218 and 14441. Collection of fossils and calcareous deposits, quartz, arrow-heads, and plants from Virginia.

Shufeldt, R. W., Assist. Surg., U. S. A. 14220 and 15451. Skin and alcoholic specimens of birds from Louisiana; also shells from Texas.

Siemachko, T. 15348. Specimens of minerals from Russia.

Siler, A. L. 13913 and 14331. Specimens of red-cedar root and rock from Utah.

Silliman, Prof. B. 15195. Specimen of tin ingot from Irish Creek Virginia ores.

Silliman, jr., B. 14456. Plaster model of the bronze statue of Prof. B. Silliman.

Simmons, Newton. 14493. Samples of earth from Maryland.

Sinks, Julia L. 15046. Specimen of stone from Texas, with imprint of printing on face.

Skillet, William. 15331. Specimens of coal and coke from Missouri.

Skinner, Alexander. 14207 and 14247. Two fresh specimens of muskrats from Potomac River, and specimen of bird's skin.

Slade, Elisha. 14221. Pair living hybrid ducks from Massachusetts.

Slater Cotton Company. 15281. Samples of holly-tree cotton cloth.

Slater, R. H. 13959. Specimen 11 gallons water from Utah Hot Springs, Utah.

Smith, Mr. 13998. Specimen of red squirrel in flesh from Montgomery County, Maryland.

Smith, A. J. 14336. Specimens of native copper with azurite in quartz from Frederick County, Maryland.

Smith, C. D. 15310. Specimen of beryl crystal from Ray mica mine, North Carolina.

Smith, Charles M. 14797, 14839, and 14891. Five hundred and twenty-six specimens of flint implements from Flint Ridge, Ohio.

Smith, E. C. 14543. Specimen of fresh fish from Newport, R. I.

Smith, Eddie N. 15127. Specimen of red slate from Connecticut.

Smith, Frank S. 13926. Specimen of building stone from Angelica, N. Y.

Smith, Hugh M. 14728, 15336, and 15337. Specimen of nest with 6 eggs of American goldfinch; also dried and alcoholic specimens of birds' skins.

Smith, J. C. 15526. Specimen of phosphatic concretion.

Smith, Peter. 15412. Large fresh specimen of German carp from Wicomico, Md.; weight, 11 pounds.

Smith, Miss Rosa. 14099. Tank of alcoholic specimens of fish from California.

Smith, R. R. 14553 and 14645. Specimens of arrow-heads, &c., from Arkansas. (Purchased.)

Smith, William F. 14119. Specimen of crania found on prairie 6 miles from Webster City, Iowa.

Smitt, Prof. F. A. 14013. Box of ethnology from Sweden.

Snyder, John J. 14821. Specimen of insect from California.

Spainhour, J. M. 13949, 14219, and 15314. Specimens of stone relics from North Carolina; photographs of hieroglyphics found at head of Gila River, near line of Arizona and New Mexico.

Spanish Mine. 15241. Specimens of ores from Utah.

Sparks & Co., George L. 14783. Specimen of porpoise from Cape May, N. J.

Spencer & McCouey. 15098. Six boxes of zinc ores from Missouri.

Sperry, Edwin A. 14375. Specimens of serpentine from Colorado.

Spicer, George W. 14729. Specimen of fish from Delaware.

Spratt, Joseph. 14355. Eight cans of salmon from Frazer River and Strait of Fuca; also sample of fish guano made from offal, &c., from Victoria, British Columbia.

Spray, S. J. 14687. Two specimens of birds' eggs from Colorado.

South Kensington Museum (London, England). 14097. Two cases of Chinese fishing apparatus and boats.

Southside Club. 14060. Specimen of fresh fish from Oakdale, Long Island.

South Side Mining Company. 15211 and 15212. Four boxes specimens of zinc and lead ores from Galena, Kans.

Southwest Lead and Zinc Company. 15160. Two boxes zinc ore, spelter, &c., from Missouri.

Southwick & Jencks. 15379. Specimen of bird's skin (roseate spoonbill). (Purchased.)

Stadtmüler, L. 14898, 14991, and 15007. Specimens of minerals from Connecticut; 1 box of rocks. (Purchased.)

Staebner, F. W. 14297. Specimens of minerals from Massachusetts.

Stark, W. 13939. Specimen of mineral from West Virginia.

State Line and Sullivan Railroad Company. 14926. Samples of Loyalsock coal from Towanda, Pa.

Staunton & Moses. 14737. Plans of spiegel furnaces from Jersey City, N. J. (Purchased.)

Stayton, Frank. 14574. Specimen of insect from Delaware.

Stearns, R. E. C. 14244, 14519, 14538, 14665, 14666, 14667, 14668, and 14803. Two hundred and twenty-two specimens of minerals and ores, native gold, silver, and copper, sonorous sand, Indian and stone relics, 2 boxes of shells, crustacea, invertebrates, ornithology, insects, foods, seeds, &c., from Western States, Mexico, Chili, Samoa, &c.; 19 specimens of wood, fiber, pulp, and paper made of the *Yucca brevifolia* from Mojave Desert, California.

Stearns & Co., Frederick. 14697 and 14721. Twenty-four specimens of birds' skins from Jamaica, West Indies, Central America, and Costa Rica (purchased); also collection of materia medica. (Gift.)

Stearns & Co., John U. 14777. Specimens of silk and silk fabrics.

Stearns, Silas. 14125. Alcoholic specimens of invertebrates and pompano shells from Florida.

Steedman, I. G. W. 15380. Two specimens of fresh fish from Missouri.

Steele, Robert L. 14677 and 14736. Specimen of broken iron pot and section of same imbedded in tree 33 feet above ground, done by cyclone near Rockingham, N. C., February 19, 1884; also specimen of Indian pottery.

Stejneger, Dr. Leonhard. 13988, 14018, 14032, 14210, 14491, 14495, 14654, 15021, and 15022. Collection of birds' skins and swans from Norway, Faroe Islands, Denmark, Brazil, Madagascar, Newfoundland, and Europe.

Stennitt, B. W. 14620. Specimen of worm from Pennsylvania.

Stephenson, J. A. D. 14073 and 15492. Specimen of Indian relic and minerals, and specimen of corundum, from North Carolina. (Loaned.)

Sterling, Dr. E. 14467. Specimens of dip-net and spears used by fishermen of Lake Erie, at Cleveland, Ohio.

Stevenson, James. 14194. Sample of earth.

Stewart and Griffith. 14063. Samples of earth from Calvert County, Maryland.

Stilh, F. H. 15198. Specimen of ore from North Carolina.

Stillman, *Horace E.* 14308. Fresh specimen of shad (hermaphrodite).

Stockton, *W. M.* 14546. Specimen of mineral from Virginia.

Stoerzer, *Mrs. L.* 13934. Four spindles and two whorls from Germany.

Stolley, *George.* 13968 and 14083. Samples of cement from Texas.

Stonaker, *C. L.* 14321. Specimens of rock and minerals from Colorado.

Stone, *W. W.* 14015. Specimens of jute from Mississippi.

Stoney, *George M.*, *Lieut. U. S. N.*, *U. S. S. Ounalaska.* 14923. Specimens of rocks, sand, &c., collected from new volcano in Behring Sea.

Storey, *Jerome* (*through E. W. Allis*). 14908. Specimens of stone relics from Michigan. (Loaned.)

Stout, *M. E.* 14160. Specimen of ore from New York.

Stover, *E. S.* 15114. Box of alcoholic fishes and mineral water from New Mexico.

Strauch, *John H.* 14871. Specimen of alum crystal from Pennsylvania.

Stubbs, *W. P.* 15061 and 15122. Paintings of the brig Eugene Hale and U. S. S. Meteor; also 3 oil paintings of fishing boats.

Stufflebeam, *J. G. & H. E.* 14534 and 14535. Specimens of minerals from Arkansas.

Sturges, *C. M.* 15062. Specimen of insect from Illinois.

Sturgis, *Appleton.* 14322. Specimens of jute butts as received from Calcutta, and samples of sliver yarn, &c., made from the butts used in the manufacture of gunny cloth.

Sturtz, *B.* (*through Felix Flügel*). 14924. Five boxes rock specimens from Germany. (Purchased.)

Sumter, *J.* (*through Col. M. McDonald*). 14523 and 14643. Specimens of young fish from Virginia.

Sutton, *Col. P. D.* 14137. Specimen of manganese oxide from Virginia.

Swan, *H. R.* 15328. Specimens of minerals from New York.

Swan, *James G.* 15152, 15196, and 15477. Alcoholic fishes and model of whaling canoe; also large collection of ethnology from Washington Territory and British Columbia.

Swan, *John D.* 15325. Specimens of minerals from Antwerp, N. Y.

Swann, *William M.* 15311. Six packages specimens of fire-clay from North Carolina.

Switzer, *Mrs. Mary.* 14451. Specimen of egg from Rockbridge County, Virginia.

Tagore, *Rajah Sourindro Mohun.* 14094. Collection of Indian musical instruments, articles used in religious and domestic service, specimens of clay figures, velvet embroidered with gold; also works on music, &c., from India.

Tate, *E. O.* 14518. Specimen of insect from North Carolina.

Taussig, *A.* 13995. Twelve packages of garnets, uncut, cut, and polished, from Bohemia.

Taylor, *F. W.* 14616 and 14748. Specimens of silver ore and tarantula from New Mexico.

Taylor, *W.* 14463. Collection in ethnology from Alabama.

Telegraph Mine. 15239. Specimens of ore from Utah.

Thatcher, *L. F.* 14542. Specimen of mineral from Iowa.

Thayer, *A. H.* 14483. Two specimens of birds' skins from New York.

Thibault, *J. K.* 14604. Specimens of pottery from Arkansas.

Thomas, *W. S.* 14460. Specimen of talc from North Carolina.

Thompson, *Edward H.* 14511. Bottle of alcoholic specimens of eels from Buzzard's Bay, Massachusetts.

Thompson, *Heber S.* 14866. Three boxes specimens of brogans, and 2 cubes made from anthracite coal from Pennsylvania.

Thompson, *Mrs. Oscar G.* 15312. Collection of silk cocoons from North Carolina.

Thompson, *W. W.* 14383. Specimens of stone relics from New York.

Thurber, *Lewis B.* 15258. Fresh specimen of green turtle from Long Island.

Tibbitts, *J. H.* 13999, 14597, and 14650. Specimens taken from sand rock, and specimens of plants and minerals, from California.

Tiffany & Co. 14540, 14670, 14909, 15063, 15198, and 15208. Ten alligator skins, samples of leather, &c., pearl jewelry, minerals, and gems.

Tilghman, *B. C. & R. A.* 15525. Four hundred pounds of chilled-iron globules for sawing and grinding. (Purchased.)

Todd, *Aurelius.* 14714. Specimen of mineral from Oregon.

Todd, *H. L.* 14571. Shingle from the smoke-house of General George Washington at Mount Vernon, Va.

Torrer, *A.* 13997. Two skins of thick-billed parrot from Durango, Mexico.

Towne, *F. H.* 14115. Jar of Chinese "shamshue."

Townsend, *Charles H.* 13917, 14105, 14127, 14290, 14576, 14830, 14836, 14920, 14922, 14955, and 15055. Twenty-eight packages containing large collection of birds' skins, nests, eggs, skins and skeletons of mammals, fossils, alcoholic skins of mammals, reptiles, fishes, &c., from Farallone Islands and California.

True, *F. W.* 14834 and 15026. Specimen of jade from New Zealand, and skull of porpoise from Hatteras, N. C.

Tucker, *J. Lee.* 14131. Three specimens of ores from Oneonta, N. Y.

Tupper, *H. E.* 14061. Specimens of lizards from Florida.

Turner, *D. C.* 14524. Living specimen of horned toad.

Turner, *E. Y.* 14789. Specimen of beryl from Edgecomb mica mines, Maine.

Turner, *H. W.* 14439, 14588, 14708, and 15043. Specimen of bat, fresh specimens of gopher, snakes, and insects from California.

Turner, *Lucien M.* 13922, 14584, and 15388. Forty-five packages of general natural history and ethnology from Labrador and Ungava Bay, Hudson Bay Territory; also alcoholic specimens of mammals, reptiles, and insects from California.

Unexcelled Fireworks Company. 15386. Campaign badges and regalia.

Union Stone Company. 15467. Samples of emery and corundum in the rock and in the grain as prepared for commerce.

University of Cambridge, England. 14240. Skeleton of *Delphinus tursio.*

University of Oxford, England (through Prof. H. N. Moseley, F.R.S.). 13967 and 14091. Specimens of Jurassic fossils, plants, crustacea, and brachiopods from stone fields near Oxford, England; also box of plaster casts of mammals and birds.

Upham, Mrs. E. P. 14820. Specimen of insect from Massachusetts.

Vail, Stephen. 14149. The Morse telegraph instrument—the only remaining one of the two made at the Speedwell Iron Works, Morristown, N. J., and the one which received the first telegraph message, "What hath God wrought!" in 1844.

Vance, Mrs. S. P. 14758. Specimen of carved stone pipe from Kentucky. (Loaned.)

Vansice, Mrs. Isaac. 15327. Collection of minerals from Natural Bridge, N. Y.

Van Tuyle, Senhora Marie Louise. 14485. Twelve specimens of wax fruits, 7 cloth figures, and 1 native tea-set made of paper from Brazil.

Van Winkle, A. S. 14471. Two small specimens of fishes from Iowa.

Van Berlepech, Count. 14422. Collection of birds' skins from South America and Malacca.

Von Ringharz, Theodore. 15145. Specimen of mineral from North Carolina.

Waddell & Co., R. J. 14704 and 14733. Specimens of polishing material (ground and bottled pumice and rotten-stone).

Wake County, North Carolina. 15266 and 15315. Specimen of soapstone and red sandstone.

Walcott, C. D. 15140 and 15299. Four specimens of minerals from Globe copper mines, Arizona; also samples of acorns used as food by the Apache Indians.

Walker, John and Charles. 14209. Alcoholic specimens of birds, bats, reptiles and insects from Illinois.

Waller, William. 14696. Stone implement from Kentucky.

Wanlass, John. 14843. Specimen of miner's lamp, with match box and picker.

Ward, Prof. Henry A. 14479, 14623, 14669, 14731, 14771, 14837, 14916, 14929, 14974, and 15242. Collection of birds' skins, skins and skeletons of mammals, ostrich and emu eggs, shells, corals, building stones, &c., from various localities.

Ward and Howell. 14310, 14684, 14750 and 14919. Minerals, gems, and cut stones. (Purchased.)

Warren, Allen. 15306. Specimen of fossil coral from marl bed near Granville, N. C.

Warwick Iron Company. 14706, 14906. Specimens of furnace products, iron ore, pig iron, slag, &c.

Washington, D. C.:

U. S. Senate. (See under name of McCook, Anson G.)

Treasury Department. (See under Collector of Customs, San Francisco, Cal.)

U. S. Coast and Geodetic Survey. 14025. Six boxes of the standard weights and measures of the United States.

Life Saving Service. (See under name of Knowles, H. M.)

Revenue Marine Service. (See under name of Healy, Capt. M. A.)

War Department:

Quartermaster-General's Office. (See under names of S. B. Holabird, Quartermaster-General, and A. E. Miltimore.)

Medical Department. (See under names of Army Medical Museum, Drs. Elliott Coues, and H. C. Yarrow.)

Engineer Department:

Wright, H. G., Maj. Gen., U. S. A. 14022. Specimens of borings made in 1874 for the reclamation of the alluvial basin of the Mississippi River.

Wheeler, George M., Capt., U. S. A. 13965, 13966, 14042, and 14087. Specimen of asphaltum and iron from Black Hills, specimens of fossils from Crawfordsville, Ind., and garnet-bearing formation from near Fort Defiance, Arizona; also 31 specimens of birds' skins, specimen of encrinite, and topographical model of the San Juan mining and mountain region of Colorado. (See also under names of General O. E. Babcock and Col. A. F. Rockwell.)

Signal Corps. (See under names of John J. McLean, John Murdock, and L. M. Turner.)

Retired from active service, General M. C. Meigs.

U. S. Army. (See under names of Capts. Charles Bendire and R. H. Pratt; Assistant Surgeons R. W. Shufeldt, Timothy E. Wilcox, J. C. Merrill, and Lieut. George F. Chase).

Navy Department:

Bureau of Navigation. (See under name of Commander A. S. Barker.)

Hydrographic Office. (See under name of Commander John R. Bartlett, hydrographer.)

U. S. Navy. (See under names of Capt. George H. Perkins; Lieuts. George M. Stoney, W. A. Marshall, and J. D. McGuire; Surgeons J. M. Flint and William H. Jones; Passed Assistant Surgeon M. H. Crawford; and Ensigns A. A. Ackerman, H. G. Dresel, C. H. Harlow, C. S. McClain, and Ernest Wilkinson.)

Washington, D. C.—Continued.

Interior Department:

U. S. Geological Survey. 13931 and 13993. Ten views of Captain Dutton's Atlas of the Grand Cañon District; also 11 boxes of lithologic and mineralogic specimens collected by geologists of the division of the Great Basin. (See also under names of Prof. F. W. Clarke, T. M. Chatard, W. C. Chapin, William H. Holmes, J. B. Marcou, James Stevenson, and C. D. Walcott.)

Census Office. Eighteen boxes of iron ore. (See under name of R. Pumpelly.)

Bureau of Ethnology (J. W. Powell, Director). (See under names of Bureau of Ethnology, F. H. Cushing, H. W. Henshaw, Edward Palmer, and Victor Mindeleff.)

Department of Agriculture. 14365. Specimens of areca nuts from Hindostan.

U. S. Commission of Fish and Fisheries (Prof. Spencer F. Baird, Commissioner). 13933, 13980, 14037, 14043, 14136, 14225, 14269, 14286, 14324, 14334, 14342, 14389, 14420, 14522, 14580, 14607, 14759, 14835, 14960, 15189, 15289, 15343, 15365, 15399, 15426, 15431, 15438, 15452, and 15462. Specimens of cotton from Old Providence, West Indies; 1 barrel of corals; one half barrel geological specimens; 1 basket-trap; 2 trays homeopathic vials, 5 tanks, 850 bottles, and 310 jars alcoholic specimens of fishes, invertebrates, reptiles, birds, mammals, &c., from West Indies and Gulf of Mexico; 8 living specimens of cactus from Mexico; 27 packages of birds' skins, mammals, reptiles, and insects from Florida; 6 tank-boxes of alcoholic fishes and marine invertebrates from West Indies; a large collection of 1,400 packages containing alcoholic fishes, marine invertebrates, crustacea, &c., from the coast of Massachusetts during summer of 1884; also specimens of shark and two dolphins in flesh; large specimen of lobster; ear-bones and vertebræ of whale, with specimen of granite from Cape Cod, Massachusetts; box of deep-water barnacles from east coast of United States; 2 boxes of samples of mineral water from Wood's Holl, and model of steam seine-boat; 1 barrel and 1 keg of oysters from Chesapeake Bay; specimens of California trout, two years old, hatched at Wytheville, Va., with numerous fresh specimens of carp, goldfish, tench, crayfishes, and water-snakes from the United States carp ponds and Central Station. (See also under names of Prof. A. E. Verrill, R. Rathbun, Prof. David S. Jordan, Charles H. Gilbert, G. Brown Goode, Dr. T. H. Bean, M. McDonald, T. B. Ferguson, Joseph W. Collins, H. C. Chester, James G. Swan, and Vinal N. Edwards.)

Washington, D. C.—Continued.

Department of State. 13947. Suit of Japanese armor. (Deposited.)

Waters, William. 14844. Specimen of peacock coal from Pennsylvania.

Watkins, G. W. 14819. Specimens of minerals from New York.

Watts, J. J. 14338. Specimens of fossils from cave in Virginia.

Weaks, P. B. 14868. Specimen of natural formation from stump 20 feet below surface.

Weaver & Co., G. B. 14385. Specimen of fresh shad from New York market.

Webb, John. 15324. Twenty-five specimens of minerals from Saint Lawrence County, New York.

Webster, Frederick S. 14208 and 14393. Specimens of birds' skins (*Plegadis falcinellus*) from Florida.

Weinland, William H. 15082. Package of botanical specimens from Alaska.

Weld, George H. 14971. Specimen of branch of tree from North Carolina.

Wells, Bard. 14872. Specimen of quartz crystal and lepidodendron rock from Pennsylvania.

Wells, Frederick. 14628. Two skins of young woodchucks from Amber, N. Y.

Wells, J. G. 14051. Specimens of birds' skins from West Indies.

Wesleyan University (Middletown, Conn.). 13911, 14109, 14948, and 15460. Two boxes of minerals, birds' skins, and 250 species of land shells.

Wharton, Joseph. 13984 and 14052. Specimen of nickel-plated iron, 10 per cent. nickel on each side; also pumice from Krakatoa.

Wheeler, Charles Le Roy. 14246 and 14358. Box of shells and fresh fish from Cape May, N. J.

Wheelock, D. B. 14080. Tibia of fossil saurian.

Whitcomb, George D. 14869. Photograph of Harrison mining machine from Illinois.

Whitcomb & Co., H. C. 15354. Specimens illustrating the manufacture of electrotypes.

Electrotyping: (1) Process wood-cut and type form locked up in chase ready for mold; (2) mold in beeswax, surface block leaded; (3) deposit of copper by dynamo electric machine; (4) copper shells removed from mold; (5) copper shells loaded up with electrotype metal, principally lead; (6) finished book and duplicates of wood-cuts to be ready for the press.

Stereotyping: (1) Mold of music and type faces in dry and plaster; (2) coating of same in stereotype metal; (3) finished book and inner plate.

White, George D. 14882. Specimen of ore from Oregon.

White, George W. 14573. Package of ore from Mississippi.

White, J. C. 14986. Small collection of wax impressions of seals and coins.

White, John C. 14348. Mineral from Texas.

Whiting, Frank H. 15285. Specimen of lizard and snail shells from Connecticut.

Whiting, S. B. 14840. Sixteen boxes of coal and its associates from Pennsylvania.

Whitney, Eli. 15499. Original model of the cotton-gin invented by Eli Whitney, sr., in 1793. (Deposited.)

Whitney, T. J. 14749. Collection of minerals from Gouverneur, N. Y.

Whittenton Manufacturing Company. 15296. Samples of cotton.

Wilder, Amos. 14693 and 15523. Insects from Maine.

Wilcox, Dr. T. E., U. S. A. 14634. Arapaho saddle-bags.

Wilkinson, Ernest, Ensign, U. S. N. 14325 and 15080. Package of small insects from Ohio and minerals from Colorado.

Willcox, Joseph. 14936 and 14946. Two boxes of minerals from Pennsylvania. (Deposited.)

Williams & Everett. 14900, 15391, and 15415. Six boxes of autotypes. (Purchase, New Orleans Exhibition.)

Williams, Ezra. 14266. Specimen of ore from Cascade Mountains.

Williams, Dr. G. H. 14258 and 14416. Specimens of rocks from Germany, Italy, Baden, island of Ischia, and France.

Williams, Goodwin H. 14914. Specimen of root of a plant from Virginia.

Williams, Capt. John J. 14159. Specimens of garnet in granite from Delaware County, Pennsylvania.

Williams, J. L. 14841. Specimen of Williams's safety lamp and iron pyrites.

Williams, Capt. Thomas. 14430. Specimens of ores and fossils from Potomac River and Massachusetts.

Williams, Capt. Thomas. 14608. Four specimens of minerals from Delaware County, Pennsylvania.

Willis, John J. 13972. Specimens of insects which fell on January 19, 1884, at Westfield, N. J., after a snow storm.

Williman, H. 15115. Package of minerals from New Mexico.

Wilson, Charles F. 14371. Five specimens of welded copper.

Wilson, Thomas. 13982. Box of shells from France.

Wilson, Hon. William L. 14089. Specimens of mineral from West Virginia.

Winifrede Coal Company. 15092. Specimens of coal and slate from West Virginia.

Wise, Hon. John S. 15366. Bird in flesh from Virginia.

Witherbee, T. F. 15321. Specimen of tourmaline from Crown Point, N. Y.

Woerffel, C. T. 14029. Paper-weight composed of 38 samples of ornamental stones from Russia.

Wolford, W. L. 14746. Four birds' skins from Maine.

Wood, George H. 14855. Five negatives of Long Valley Coal Company's mines, Pennsylvania. (Purchase, New Orleans Exhibition.)

Wood, J. P. 14333. Insect from Auburn, N. Y.

Woolfe, Henry D. 15495. Specimens of coal, &c., from Cape Lisburne, Alaska.

Wooster, A. F. 15044 and 15527. Stone image (loan) and skin of squirrel from Connecticut.

Worthen, C. K. 14278, 14345, 14433, 14497, 14648, 14889, 15068, and 15502. Collection of birds' skins from Oregon, Mexico, New Mexico, Illinois, and various other localities.

Wyant, William. 15330. Two boxes, specimens of coal and coke from Eagle, W. Va.

Yarrow, Dr. Henry C., U. S. A. 14057 and 15142. Chinese bait-box, alcoholic fishes, reptiles, shells, insects, ores, and fossils from Utah.

Yaste, W. S. 14727. Specimen of bat, in flesh.

Yeates, William S. 14950 and 15349. Specimens of minerals from Mine La Motte, Missouri, and arrow-heads from North Carolina.

Yerrington, J. D. 14663. Specimens of Hiddenite, crystals and brilliants. (Purchased.)

Yoakum, F. L. 14231. Alcoholic specimens of fish from Texas.

Yosemite Mine. 15240. Two boxes, specimens of ores from Utah.

Young, G. V. 14475. Scales from the alligator gar from Mississippi.

Zahn, Henry. 15476. Specimen of sulphate of iron in crystallized form from Phillips County, Kansas.

Zeledon, José C. 13932, 14003, 14229, 14963, 14977, 15151, and 15511. Birds' skins, specimens of materia medica, fossils, stone relics, pottery, alcoholic mammals, reptiles, fishes, birds' skins, dried plants, and specimens of beads from ancient Indian mound, Costa Rica.

Zeledon, Señor Juan. 14988. Bird's skin from Costa Rica.

Zoological Society of Philadelphia. 15377 Specimen of bird in flesh.

Zukoski, E. L. 15501. Box of ores from Missouri.

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